THE TOOL ENGINEER

November 1954

Power Brushing

PUBLICATION OF THE AMERICAN SOCIETY OF TOOL ASTE ENGINEERS

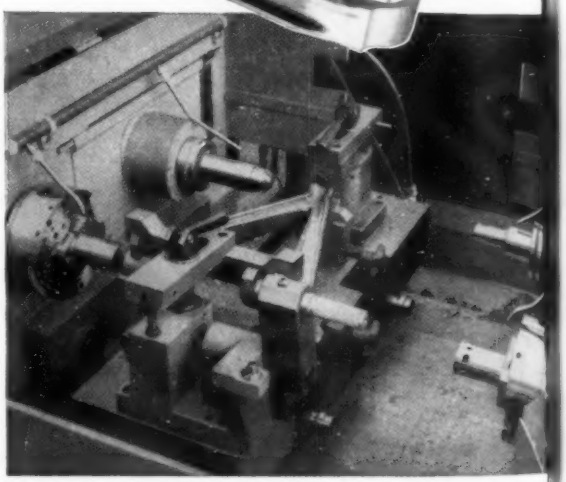
DOWN LIKE A FEATHER!

. . . a little safer, a little smoother because this part was BORIZED*

You're heading for the runway on final approach — fifty tons of airliner hurtling through space at over 100 miles an hour, yet settling to the earth as lightly as a feather. This is the time when a lot of things must work *just right.*

That they do so, thousands of times a day at airports the world over is a real tribute to the aviation industry. Such performance is made possible only through the utmost precision in every step of manufacture. That's why so many parts of the modern aircraft are borized. Here, for example, is a torque arm for a landing gear, borized on a Heald Model 422 Bore-Matic.

Whenever a part is borized, you can be sure of three things. A finer, longer-lasting, precision made part. Important savings in time and production cost. A definite competitive advantage for your product. That's why IT PAYS TO COME TO HEALD.



This Model 422, is used to bore, counterbore and chamfer se different torque arms for landing gear components. Align rails on both the boringhead bridges and the fixture sub-base in accommodating the various parts.

Basic fixture equipment consists of angle plate type with swing gate locator and hand cam clamps — gate locator is interlo so that machine will not operate unless part is correctly loca

* *Precision finished by a Heald-engineered method on a Heald Bore-Matic.*

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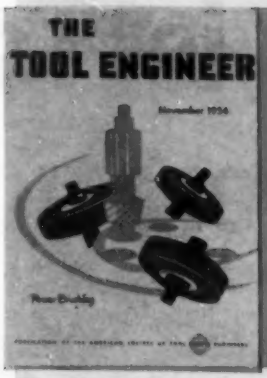
Cover ...wer brushing is estab... as an effective produ... tool, especially in fin... operations. The scope ...his process is revea... the article beginning ...age 71.



The Tool Engineer

Volume XXXIII, No. 5 November 1954

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THE TOOL ENGINEER is regularly indexed in the *Engineering Index Service* and the *Industrial Arts Index*

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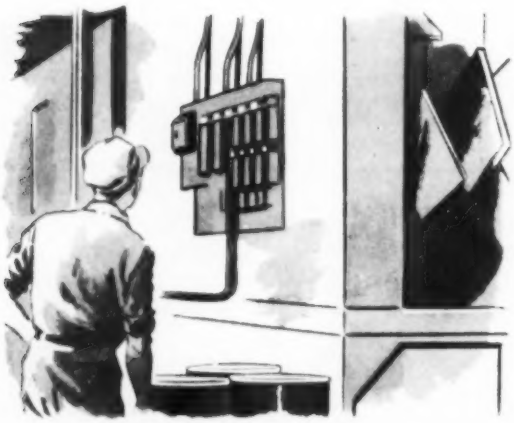

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ABC

The Tool Engineer

Give It Meaning!

Engineering has made remarkable strides largely because accumulated information has been recorded in precise language. Without a firm foundation of understanding, engineers would become bogged down with endless explanation in their communications and progress would be impeded accordingly.

For instance, if the basic terms of force and pressure were used carelessly, complete misunderstanding would result. We speak of force as the total load on a tool or on the ram of a press whereas pressure is the unit load in a system such as in a hydraulic circuit. Likewise, it should be improper to refer to a light-sensitive tube in an electronic circuit as a photocell. It is a phototube. The name photocell should be reserved to identify simple voltaic cells such as selenium or copper-oxide cells which respond to light.

In recent years, the word automation has struck the popular fancy. No other word has more dramatically made the public aware of the accomplishments of tool engineers. As an engineering term, however, it requires definition so that it will mean the same to all engineers, at least in the same field. Originally, automation defined automatic materials handling between production machines and included automatic loaders and unloaders. Now it is frequently referred to as a philosophy of production with the pushbutton factory as the ultimate.

If any number of engineers are asked to define the word, there will be as many different answers as the number of individuals queried. Certainly, a power-feed attachment on a drill press is not automation. Yet it has been so represented. Why shouldn't automation be reserved for methods of integrating production machines so that no in-process parts go to storage? The methods, then, would retain control or hold of the parts in process.

We have good definitions for machines, including manual, semiautomatic and automatic. A machine that loads and unloads without operator attention is automatic. Any degree of automaticity between manual and automatic is semiautomatic. If automation is to become a useful engineering word, not a cliché, it should be defined and not abused.

John W Greve

EDITOR

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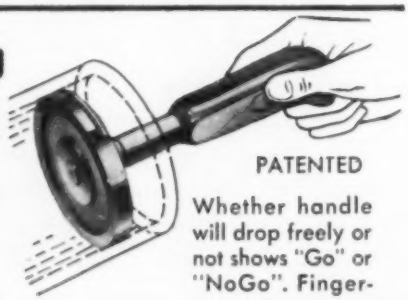

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Whether handle will drop freely or not shows "Go" or "NoGo". Finger-tip operation reveals internal bore conditions by sensitive "feel". Tells more, more easily, than ordinary plug gages.

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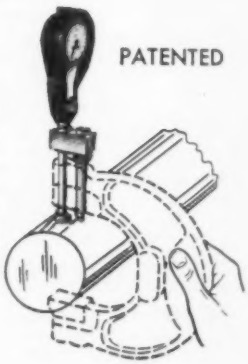

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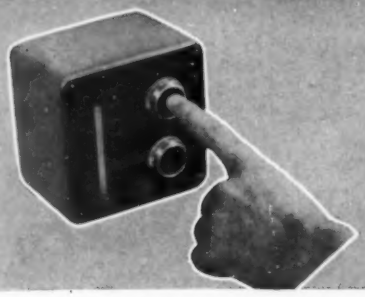

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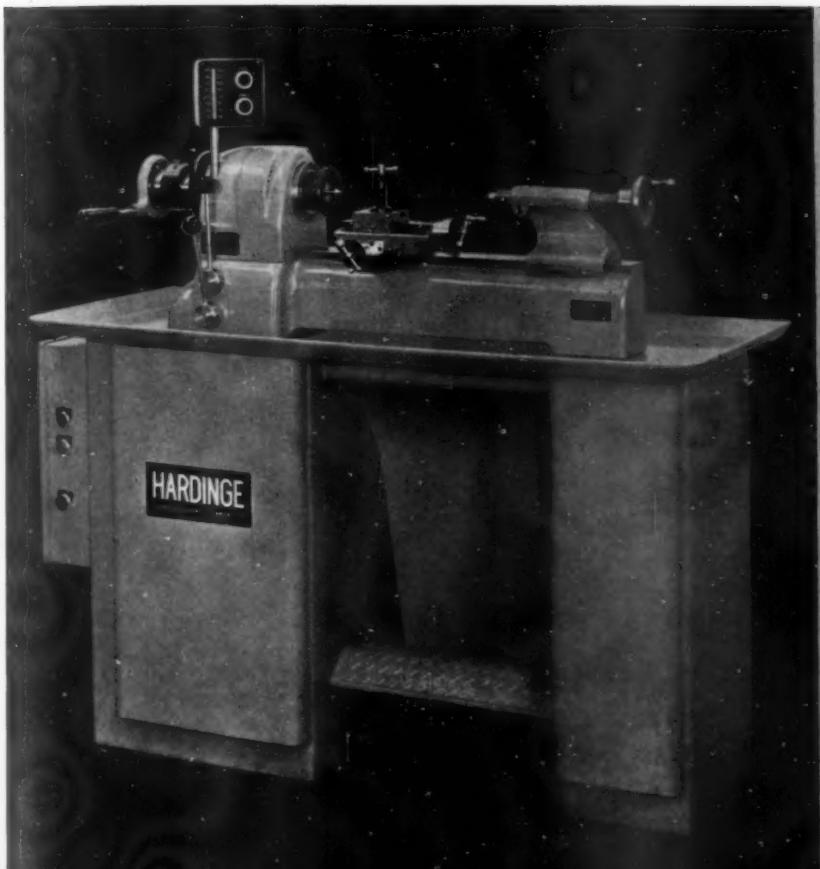

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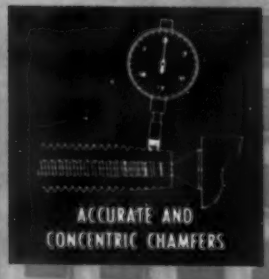

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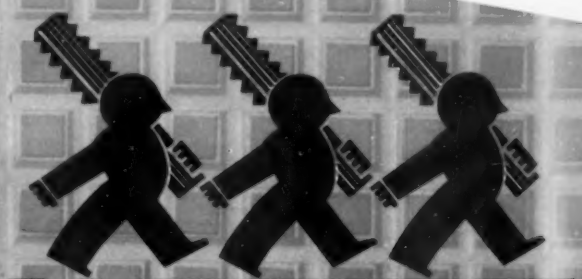

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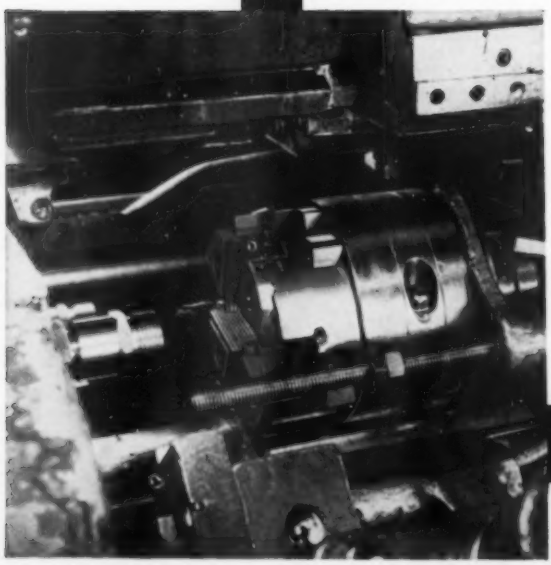

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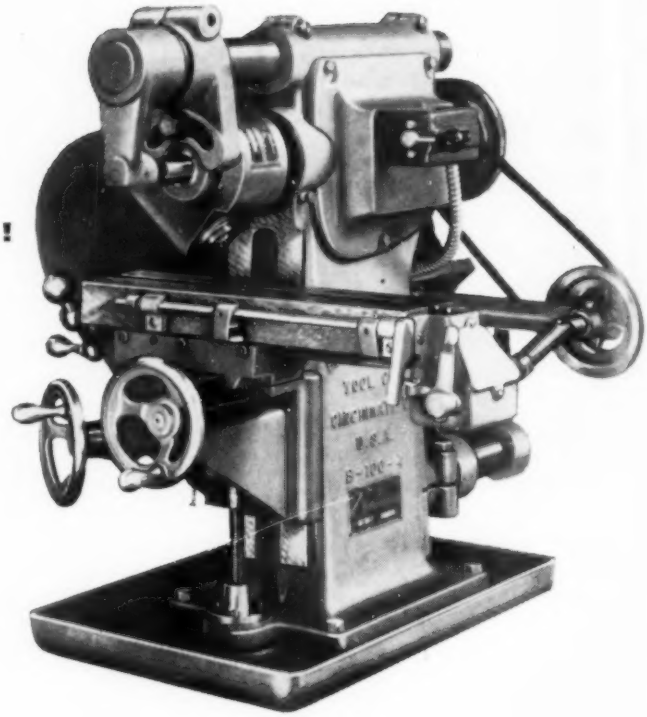

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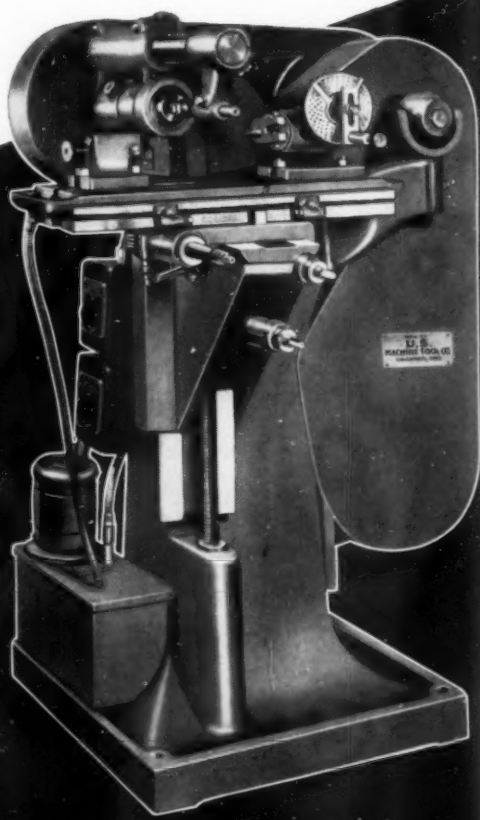

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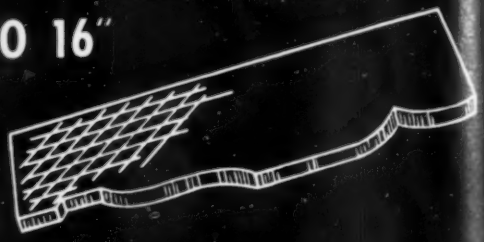
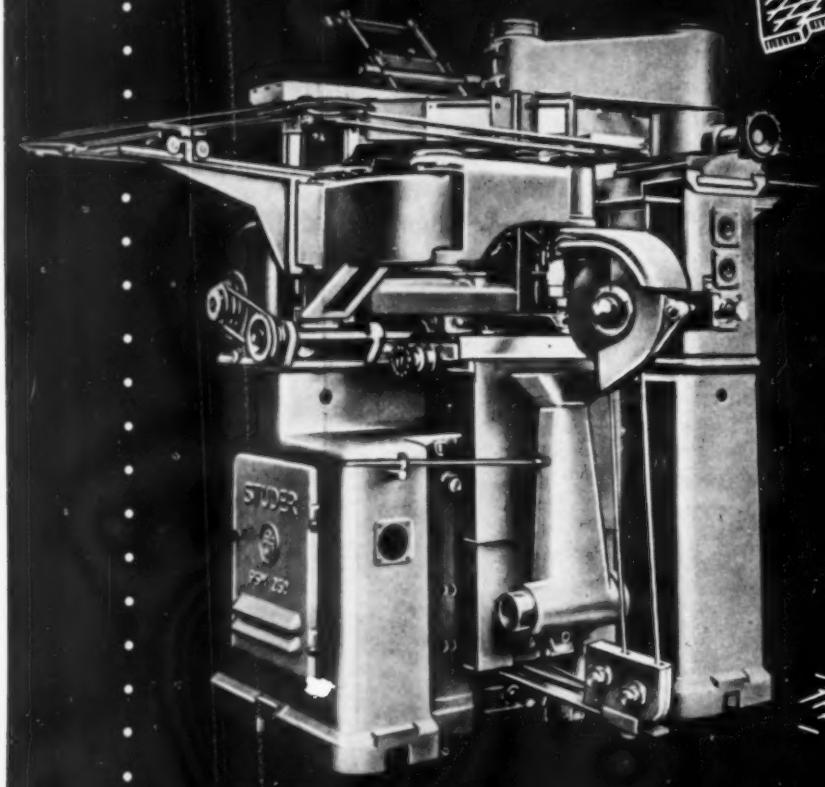
IN ONE SETTING





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NEW STUDER

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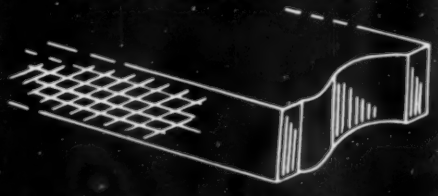

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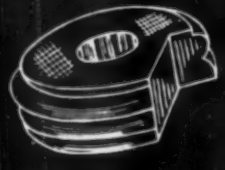

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This attachment automatically guides tracer bar along the template. The automatic, uniform feeding produces improved surface finishes and increases the life of grinding wheels. To guide tracer bar by hand, two screws are loosened to detach the device.

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Profiles can be ground to a tolerance of ± 0.0004". Closer limits are obtainable when large ratios of reductions are employed.

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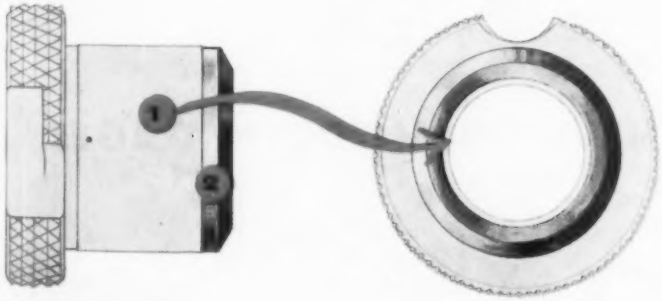

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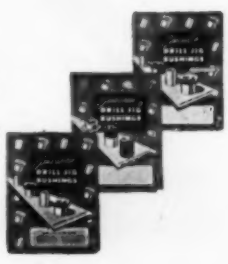
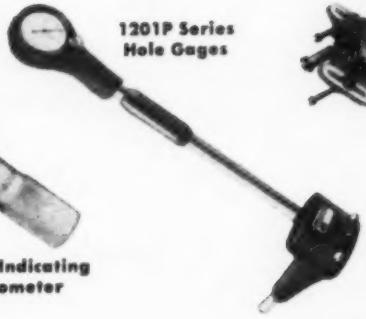


200P-1 Indicating Micrometer



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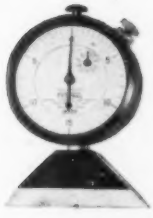
49P Series Outside Caliper Gages

205 Hole Location Gage



65P-40 Depth Gage

Ask **FEDERAL**

FOR ANYTHING IN MODERN GAGES

Regular Testmaster

Perpendicular Testmaster

Perpendicular Type Dial Indicators Six Models

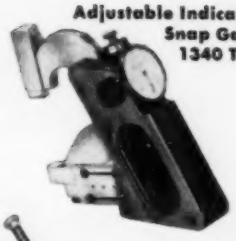
644 Heavy Duty Sheet Stock Gage

75P Series Depth Gages

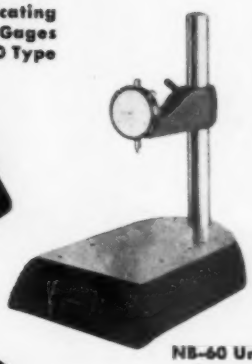
Indicating Crankshaft Gage Model 1340 P-40

Dial Indicating, Air, Electric, or Electronic — for Inspecting, Measuring,

1000 Series Adjustable Snap Gages

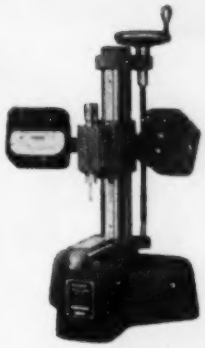


Adjustable Indicating Snap Gages 1340 Type



NB-60 Universal Comparator

K Series Deep Throat Gages



130 Electronic Comparator

and done . . .

Pitch Diameter and Spiral Gear Gage 202 Series

Which gage manufacturer has consistently produced the most complete line of reliable modern gages of practical design and dependable accuracy?

Ever since Federal offered its first Dial Indicator, 37 years ago, this company has consistently lead the way in improvements, new instruments, and new methods of gaging. First to realize the value of Quality Control by Statistics, Federal was also first to promote its use by educating men all over the country in its application.

On the other hand, Federal has consistently weighed new ideas and rejected hundreds that would not stand up to requirements. After all, you can safely entrust your gaging problems to a concern that has such a background.

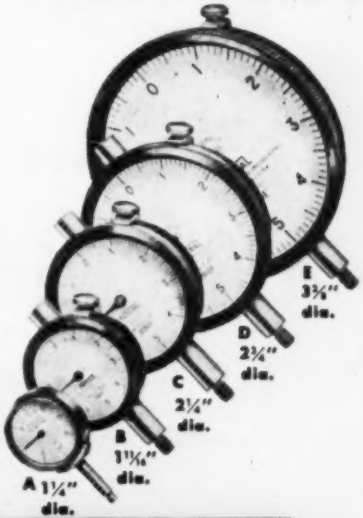
Moreover, Federal concentrates on the design and manufacture of dimensional gages — not only the wide variety of Indicator Gages shown here but also the most advanced type of Air Gages, Electric, and Electronic Gages — for continuous measuring, automatic sorting, and automatic dimensional control of parts produced on machine tools.

It's easy to investigate Federal Gages. Catalog 52 and our price list tell the whole story.

FEDERAL PRODUCTS CORPORATION
41911 Eddy Street • Providence 1, R. I.

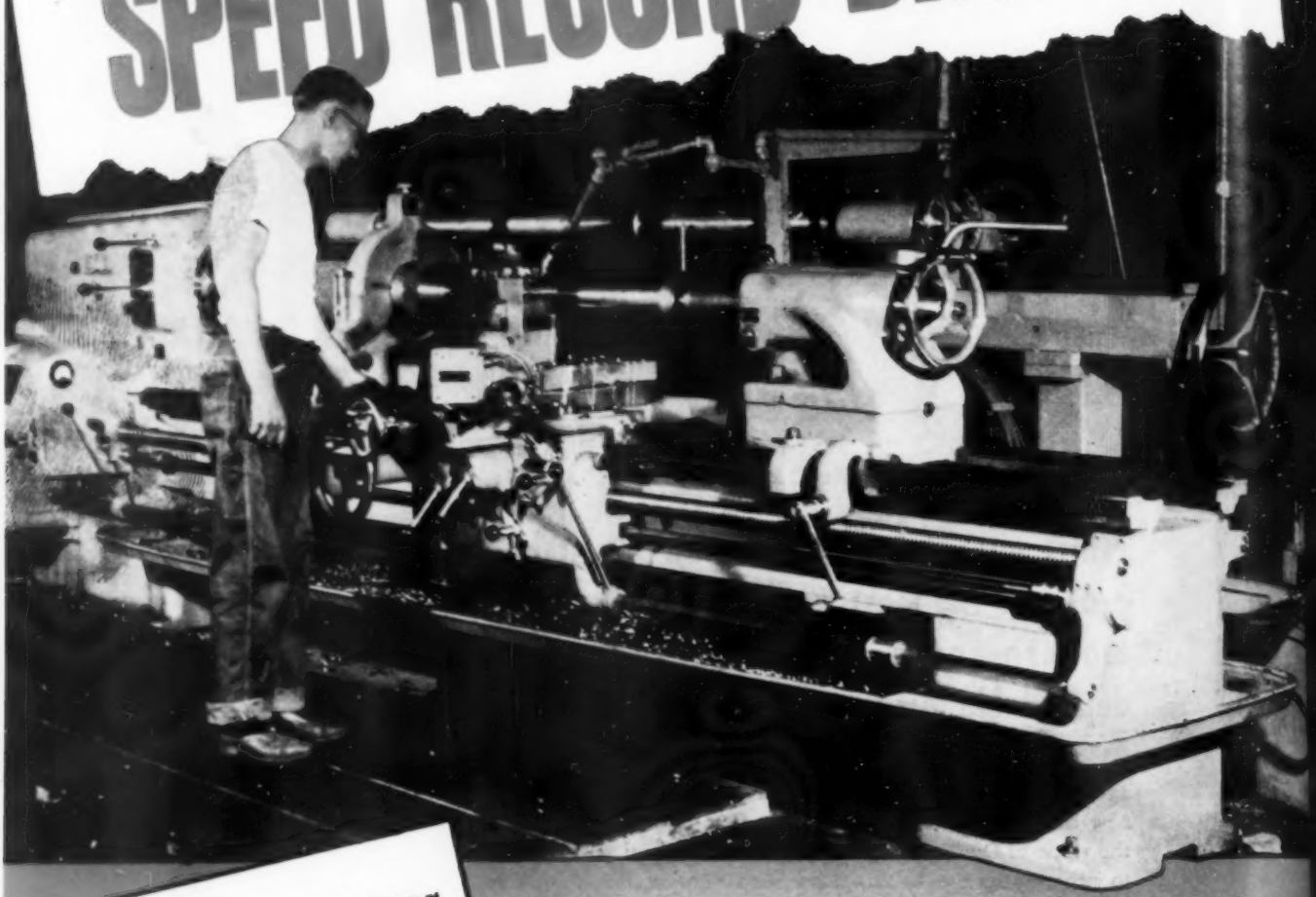
Adjustable I.D. Groove Gage

Regular Dial Indicators Greatest Selection of Dial Graduations.



Sorting, or Automatically Controlling Dimensions on Machines

SPEED RECORD BROKEN



2,000 Horse Power Motor Shafts ROUGH and FINISHED in 2¼ hrs.

Former Time 9 hours

Fairbanks, Morse & Co., Beloit, Wisconsin, is getting this amazing production day after day on its *20 inch "AMERICAN" All-hydraulic Duplicating Lathe.*

These shafts are made from 7½" diameter by 84" long hot rolled stock weighing 1059 pounds. A 30 horse power roughing cut and 15 to 20 horse power finishing cut completes the operation.

Note particularly that a finish turned motor shaft is used for a template, showing the rugged stability of "AMERICAN" Template Supports.

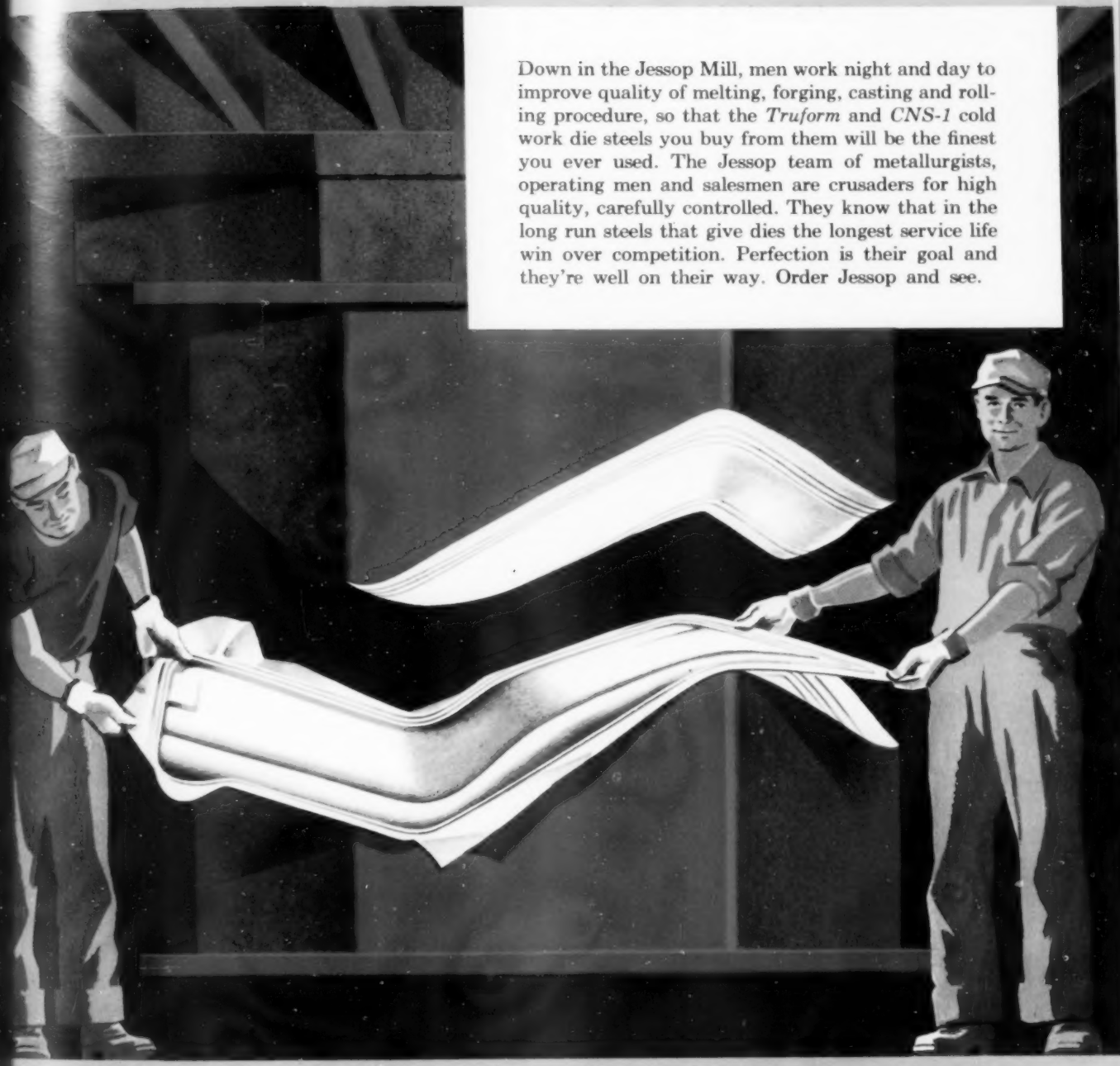
The quality of Fairbanks-Morse's products are universally recognized. We are proud indeed that so many "AMERICAN" Lathes and Radial Drills contribute to them. "AMERICAN" Hydraulic Duplicating Lathes hold many production records for work of this nature. Let us show you what they will do on your work.

Send for Bulletin No. 35.

THE AMERICAN TOOL WORKS CO. Cincinnati 2, Ohio, U. S. A.

LATHES AND RADIAL DRILLS

Jessop steel is designed to bring longer life to your dies

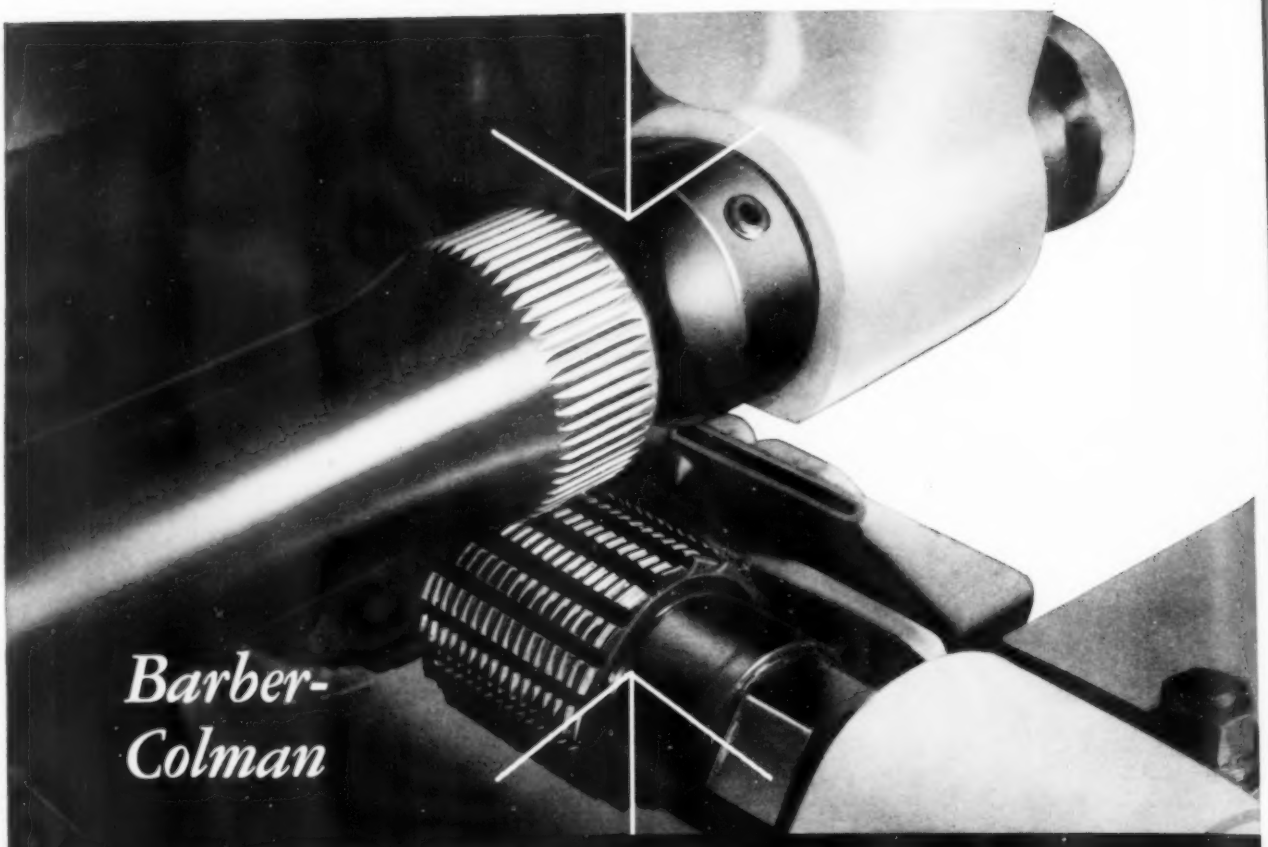


Down in the Jessop Mill, men work night and day to improve quality of melting, forging, casting and rolling procedure, so that the *Truform* and *CNS-1* cold work die steels you buy from them will be the finest you ever used. The Jessop team of metallurgists, operating men and salesmen are crusaders for high quality, carefully controlled. They know that in the long run steels that give dies the longest service life win over competition. Perfection is their goal and they're well on their way. Order Jessop and see.

STAINLESS STEELS • HIGH SPEED STEELS • NON-MAGNETIC STEELS • HIGH SPEED TOOL BITS • HEAT RESISTING STEELS • STAINLESS-CLAD PLATES • CARBON AND ALLOY STEELS • TOOL STEELS FOR SPECIAL PURPOSES • CAST-TO-SHAPE TOOL STEELS • HIGH SPEED AND ALLOY SAW STEELS • TEMPERED AND GROUND STRIP STEEL • COMPOSITE HIGH SPEED STEELS • STAINLESS AND HEAT RESISTING CASTINGS • COMPOSITE DIE STEEL SECTIONS • PRECISION GROUND FLAT STOCK • DIE STEELS—HOT AND COLD WORK

JESSOP

STEEL COMPANY · WASHINGTON, PA.



HOBBING

Doubles Tool Life,
Cuts Production Time...

Barber-Colman Hobbing Engineers, working closely with the customer on this job, combined hobs, tooling and machines for substantial tool savings and increased tool life.

New No. 16-16 Hobbing Machines, engineered with special tooling particularly for this job, are used to cut serrations on shaft ends 45-50 R.C. hardness, which approaches the upper limit of hardness for hobbing. Multi-thread Class C Accurate Unground hobs reduce tool costs considerably. The hobs are automatically shifted after each cut, resulting in an increase of 55 hobbed ends per sharpening in this hard material.

For most efficient results in tool life, production, low cost and accuracy control, hob your jobs on No. 16-16 Hobbing Machines.

BARBER COLMAN

Barber-Colman Company

GENERAL OFFICES AND PLANT, 6811 ROCK STREET, ROCKFORD, ILLINOIS

why you should put SUPERFINISH in your blueprints

Longer life, better performance—yes, and *lower costs, too*—should be engineered into the product at the start. For example: when you specify Gisholt SUPERFINISH, you accomplish two things: First, you assure a bearing surface free of the imperfections that cause wear—a surface that will last indefinitely. Second, you cut the cost of grinding—or even eliminate it. Surprisingly enough, you can in most cases achieve this superlative finish at lower over-all cost than is possible with other methods of finishing.

HAVE YOU A COPY OF THIS BOOK?

It's the most complete and authoritative textbook ever published on this important subject. So popular, it is already in its third printing. Fascinating, fully illustrated, yours for the asking. Use the coupon.

GISHOLT MACHINE COMPANY
Madison 10, Wisconsin

THE GISHOLT ROUND TABLE
represents the collective experience of specialists in the machining, surface-finishing and balancing of round and partly round parts. Your problems are welcomed here.

Gisholt Machine Company
Madison 10, Wisconsin
Gentlemen:
Please send my free copy of "Wear and Surface Finish."

Name.....*Title*.....
Company.....
Street Address.....
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TURRET LATHES • AUTOMATIC LATHES
SUPERFINISHERS • BALANCERS • SPECIAL MACHINES

TIGHTEN YOUR GRIP ON PRODUCTION

Production flows faster and smoother when your machine tools are equipped with Jacobs Chucks.

Rugged construction, great gripping power and accuracy have made The Jacobs Plain Bearing Drill Chuck the choice of machinists throughout the world.

The Jacobs Manufacturing Company, West Hartford 10, Connecticut.

IF IT'S A JACOBS IT HOLDS

Jacobs and your local distributor

are ready to deliver the chucks you need and the service you deserve.

. . . first in chucks

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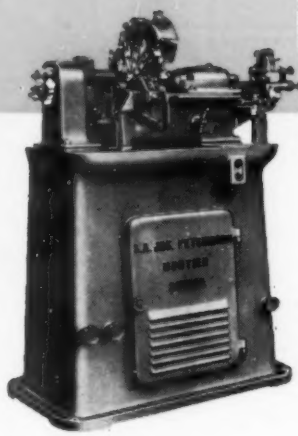
THE LITTLE GIANT OF THE PETERMANN FAMILY



For work within its capacity (pieces 5/32" in diameter and 1½" long) we offer a machine of deadly accuracy and high production . . . 10 speeds to 12,000 RPM.

The P-4 AUTOMATIC

On this page we can show only *one* of the P-4's salient advantages . . . the ability to remove a tool for sharpening without removing it from the tool holder . . . *and grinding in place.*

The many other advantages are described in Catalog sent on request.

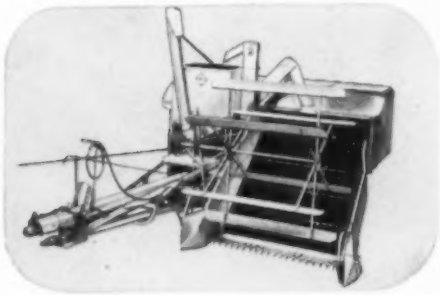
RUSSELL, HOLBROOK & HENDERSON, INC.

292 Madison Avenue, New York 17, N. Y.

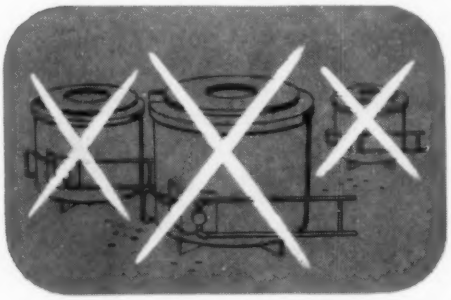
"Cyanide pots scratched . . . *LINDBERG* Carbonitriding Furnaces win in a walk!"

1. Owner, Allis-Chalmers, internationally known maker of farm machinery.

2. Allis-Chalmers purchased 3 Lindberg Carbonitriding Furnaces for its La Porte Works.



3. Furnaces used to heat-treat farm machinery parts—from a few ounces to 5 pounds.

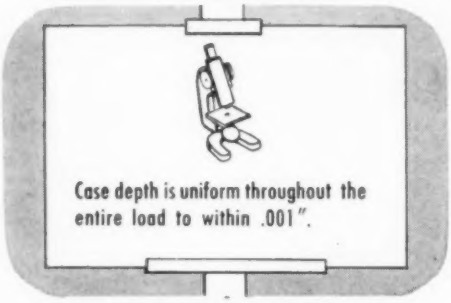


4. Old salt pots did not provide needed volume or desired uniformity of case depth.

WITH *LINDBERG* CARBONITRIDING FURNACES

One man does 5 times more than with salt pots.

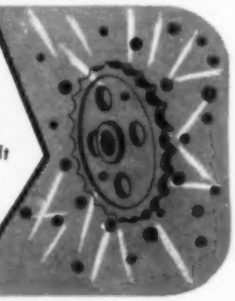
5. This factor represents a tangible, specific saving in operating and labor costs.



6. In addition to this advantage, working conditions were substantially improved.

NO SHOT BLASTING COST NOW

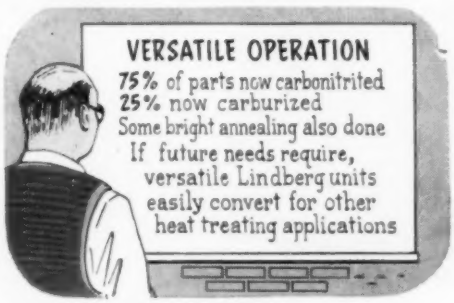
to remove frozen salt from fine threads tapped in parts . . . costly . . . high scrap rate.



7. Shot blasting eliminated . . . case depth requirements of .005 to .030 met.

VERSATILE OPERATION

75% of parts now carbonitrited
25% now carburized
Some bright annealing also done
If future needs require, versatile Lindberg units easily convert for other heat treating applications



8. Neutral hardening, carbon correction, tool treating—done with simple switch-over.

HOW ABOUT *YOUR* PLANT?

Perhaps we can help solve a production problem that will increase output, improve working conditions, and cut costs in your plant, too.

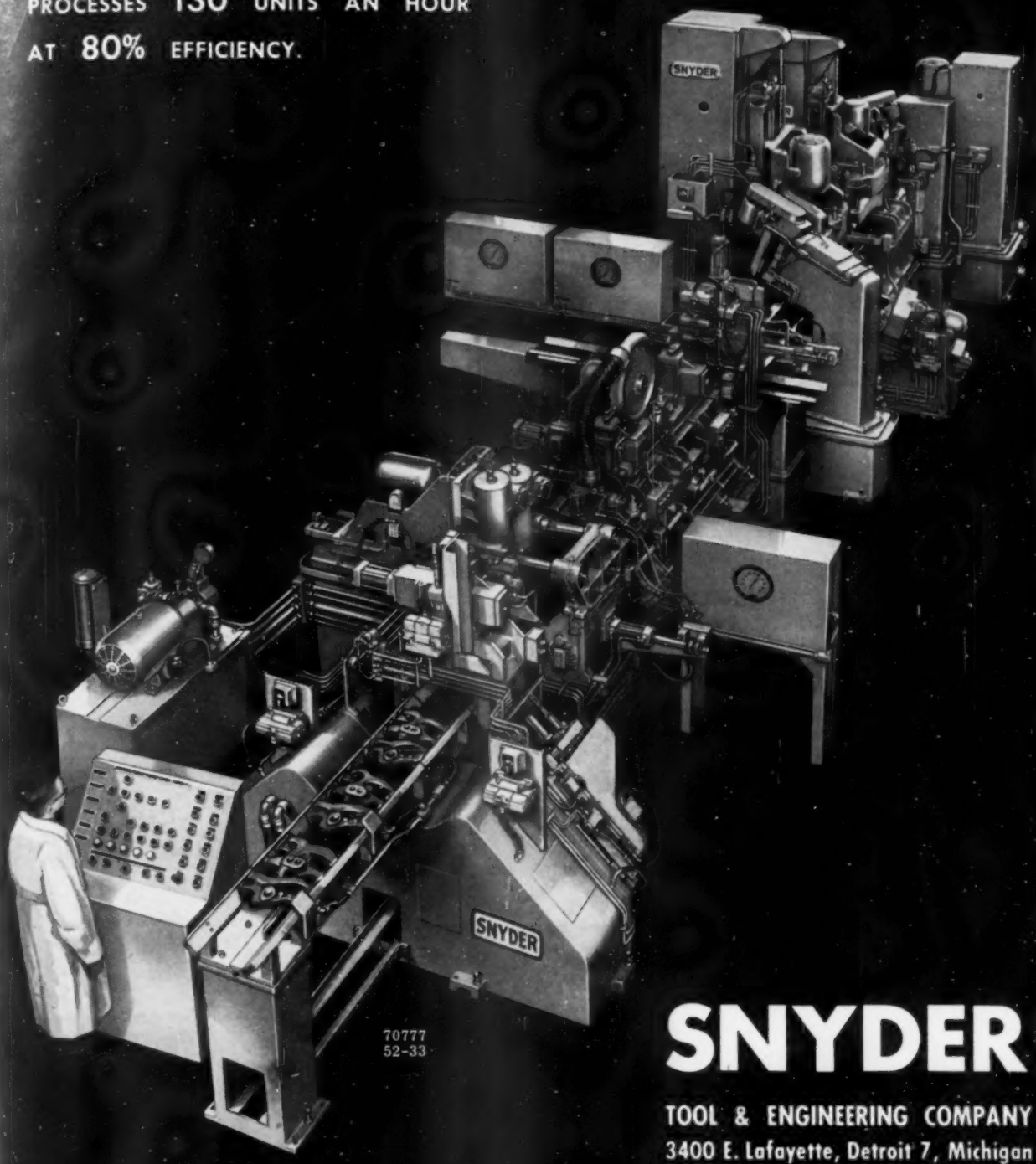
Write for our Bulletin No. 241.

LINDBERG *FURNACES*

LINDBERG ENGINEERING COMPANY
2447 W. Hubbard Street • Chicago 12, Illinois

SNYDER SPECIAL 21-STATION AUTOMATIC LINE

TRANSFER MILLS, DRILLS, CORE-DRILLS, REAMS AND TAPS INTAKE MANIFOLDS; TESTS MANIFOLD FOR AIR LEAKAGE AND VOLUMETRIC AIR FLOW, INSPECTS PROCESSING PROGRESSIVELY, MARKS REJECTS; INSERTS HEATER TUBES; PROCESSES 130 UNITS AN HOUR AT 80% EFFICIENCY.



SNYDER

TOOL & ENGINEERING COMPANY
3400 E. Lafayette, Detroit 7, Michigan
29 Years of Successful Cooperation with Leading American Industries

Your NEW KEY to Precision TAPPING

MORSE "Vectormatic" Ground TAPS

with "locked in" precision

Now Morse takes another giant step ahead . . . this time with "Vectormatic" Tap-Thread Grinding . . . an entirely new process that includes an entirely new method of close-tolerance gaging.

The tap is sized by exclusive Vectormatic "Magic-Mike" control. Size control mechanism and the adjusting segment of the circuit are *completely locked-in*, to insure uniformity.

In the whole operation, the work is never touched by the gaging mechanism, which is controlled by an invisible wall of electrons activating a series of relays. Control mechanism is unaffected by voltage fluctuations and vibrations.

That's why Morse Vectormatic Thread Grinding is the most precise method in use today . . . and why Morse Taps are now, even more than ever before, your best buy. Call your Morse-Franchised Distributor *now* . . . your only source for Vectormatic Ground Taps.

MORSE TWIST DRILL & MACHINE COMPANY
(*Division of VAN NORMAN COMPANY*)
NEW BEDFORD, MASS. · *Warehouses in* New York, Detroit, Chicago, Houston, San Francisco

MORSE
Cutting Tools

. . . buy them by phone from your Morse-Franchised Distributor and save ordering time

NO down

Photos courtesy Century Machine Company, 4434 Marburg Avenue, Cincinnati 9, Ohio

time in 16 years...

The records of the Century Machine Company show "no down time in sixteen years use" on this Cincinnati Press Brake.

This machine, working a 9½ hour day, forms light gauge sheets in mild and stainless steel up to ¼" thickness. It is constantly producing accurate parts for easy assembly of Century's baking ovens and bakery machinery.

Write for free Vinyl Plastic Tonnage chart TC-6 on your company's stationery.

● Flour Storage Bins—each 1000 lbs. capacity

THE CINCINNATI SHAPER CO.

CINCINNATI 25, OHIO, U.S.A. SHAPERS • SHEARS • BRAKES

CINCINNATI

AUTOMATIC "UP AND OVER" TRANSFER

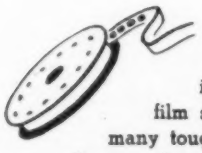
Three boxes—450 lbs. each—are loaded in car. When doors are closed the car raises to carrier.

When car reaches upper limit, the Mono-Tractor propels carrier on the MonoRail to No. 2 mill.

SAVES $30,000 PER YEAR

Here is an "Up-and-Over"* system that eliminates 72 hours of handling labor per day. It automatically transfers 180 full bobbin boxes from three floors of one mill to one floor of another and returns the empties. Estimated savings in labor, trucks, floors and traffic congestion run upwards of $30,000 per year.

It is another of the many examples of American Mono-Rail engineering for low-cost handling within space limitation. Let one of our field representatives explain further the versatility and low maintenance of American Mono-Rail equipment.



***"UP-AND-OVER"**

is the title of our 16-mm. sound film showing how MonoRail solves many tough handling problems. Please allow us three weeks to schedule showing.

AMERICAN MONORAIL COMPANY

OVERHEAD HANDLING EQUIPMENT

13133 ATHENS AVENUE • CLEVELAND 7, OHIO

Carrier travels at 50 f.p.m. around curves—150 f.p.m. on straight track with slow approach at towers.

At No. 2 mill car lowers to third floor for delivery of full boxes and return dispatch of empties.

Microbore

TANDARD BORING BAR SETS

for use on all Makes and Types of Boring and Milling Machines

Discuss your tooling problems with our Microbore specialists

Standard Microbore Boring Bar Sets are available in a wide range of sizes with Morse Taper or Milling Machine Taper Shanks.

Send for new illustrated Catalog.

DE VLIEG MICROBORE COMPANY

480 Fair Avenue, Ferndale • Detroit 20, Michigan

FOR FURTHER INFORMATION, USE READER SERVICE CARD; INDICATE A-11-29

Here's help in

ORDERING HYDRAULIC VALVES!

Use the form below to get specific information, prices, circuit designs and other data you may need on hydraulic valves.

Rivett catalogs 190 standard models in all popular sizes, types, actions, piston designs and pressures. Nearly any hydraulic valve requirement you may possibly have can be filled by Rivett. And Rivett's Factory Engineers and experienced Sales Representatives will assist in planning the most efficient circuits for your operations.

We are interested in the Hydraulic Valves checked below.

☐ Send complete literature, specifications, and circuit information. ☐ Send quotations on items checked. ☐ Have our Rivett Representative call and supply circuit information. ☐ Our specific hydraulic problem is:_____

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Mail This Form Today. Or File For Future Use!

RIVETT LATHE & GRINDER, INC.,
Fluid Power Division
Dept. TE-11, Brighton 35, Boston, Mass.

☐ Hand
- Operation:
  - ☐ Threaded Stem
  - ☐ Lever
  - ☐ Knob
- Action:
  - ☐ Manual
  - ☐ Spring
  - ☐ Ball Detent

☐ Cam

☐ Foot

☐ Direct Solenoid Operated
- Mounting:
  - ☐ Pipe
  - ☐ Sub-Plate
- ☐ Double Solenoid No Spring
- ☐ Single Solenoid Spring Return
- ☐ Double Solenoid Spring Centered

☐ Solenoid Pilot Operated
- Mounting:
  - ☐ Pipe
  - ☐ Sub-Plate
- ☐ Double Solenoid No Spring
- ☐ Single Solenoid Spring Return
- ☐ Double Solenoid Spring Centered

☐ Oil Pressure Operated
- ☐ No Spring
- ☐ Spring Return
- ☐ Ball Detent
- ☐ Spring Centered

☐ Air Pressure Operated
- ☐ No Spring
- ☐ Spring Return
- ☐ Spring Centered

☐ Oil Pilot
- Mounting:
  - ☐ Pipe Line
  - ☐ Base
  - ☐ Foot
  - ☐ Panel

☐ Flow Control

☐ Check
- Mounting:
  - ☐ Pipe
  - ☐ Flange
- ☐ Spring Loaded
- ☐ Pilot Operated
- ☐ Pilot Operated with Pressure Breaker

☐ Shut Off

☐ Deceleration

☐ Relief

☐ Unloading

☐ Sequence
- ☐ Direct Operated
- ☐ Remote Operated
- ☐ With Integral Check

☐ Counter-Balance

Sizes

☐ ¼, ☐ ⅜, ☐ ½, ☐ ¾, ☐ 1, ☐ 1¼, ☐ 1½

Pressures

☐ 1500 P.S.I. ☐ 3000 P.S.I.

Specify Valve Action Desired

_____

_____

_____

NAME_____ **TITLE**_____

COMPANY_____ **CITY**_____ **STATE**_____

RIVETT **furnishes a complete power package**

VALVES • CYLINDERS • POWER UNITS
Air and Hydraulic
All sizes and types

A MODERN IDEA THAT SAVED MILLIONS!

The quick-change drill chuck was originated by Modern. It was and is one of the most outstanding contributions ever made to low-cost drilling ... an idea that has saved millions of dollars in drilling time!

Simple, strong and sturdy, Modern-Magic Chucks will do an outstanding job for you.

MODERN TOOL WORKS

DIVISION

CONSOLIDATED MACHINE TOOL CORPORATION

WHOLLY OWNED SUBSIDIARY OF FARREL-BIRMINGHAM COMPANY, INCORPORATED

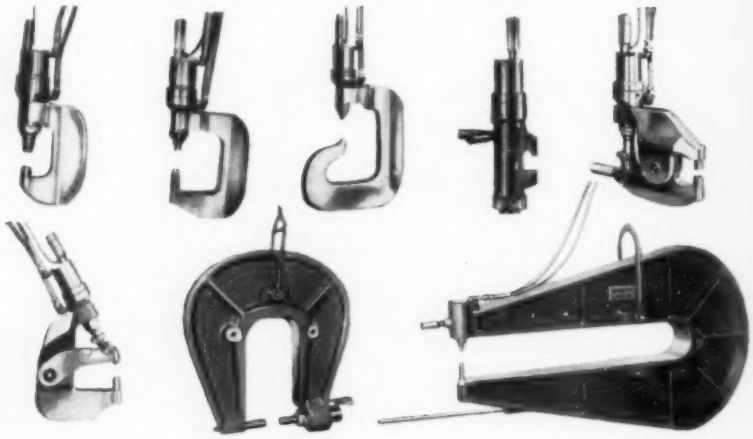
ROCHESTER, NEW YORK

how leading car, truck and trailer builders solve production riveting problems with Hannifin "HY-POWER" Hydraulics

1 They select the correct size "Hy-Power" Hydraulic Cylinders

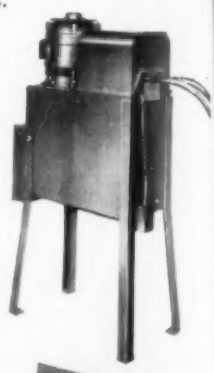
Hannifin supplies "Hy-Power" Hydraulic Cylinders in 7½ to 100-ton capacities (more in multiple) to exert the force exactly when and where you want it.

2 They mount the cylinders in Hannifin "C"-Frames



The "Hy-Power" line includes standard "C"-frames in a wide variety of sizes and types for portable or stationary use. Or, if your requirements are special, Hannifin will design and build "C"-frames to suit your needs.

3 Power source is the exclusive "Hy-Power" Pressure Generator



Here's Hannifin's patented, noiseless pressure generator. It's a compact unit that combines motor, pump, oil reservoir, control valves and high-pressure intensifier.

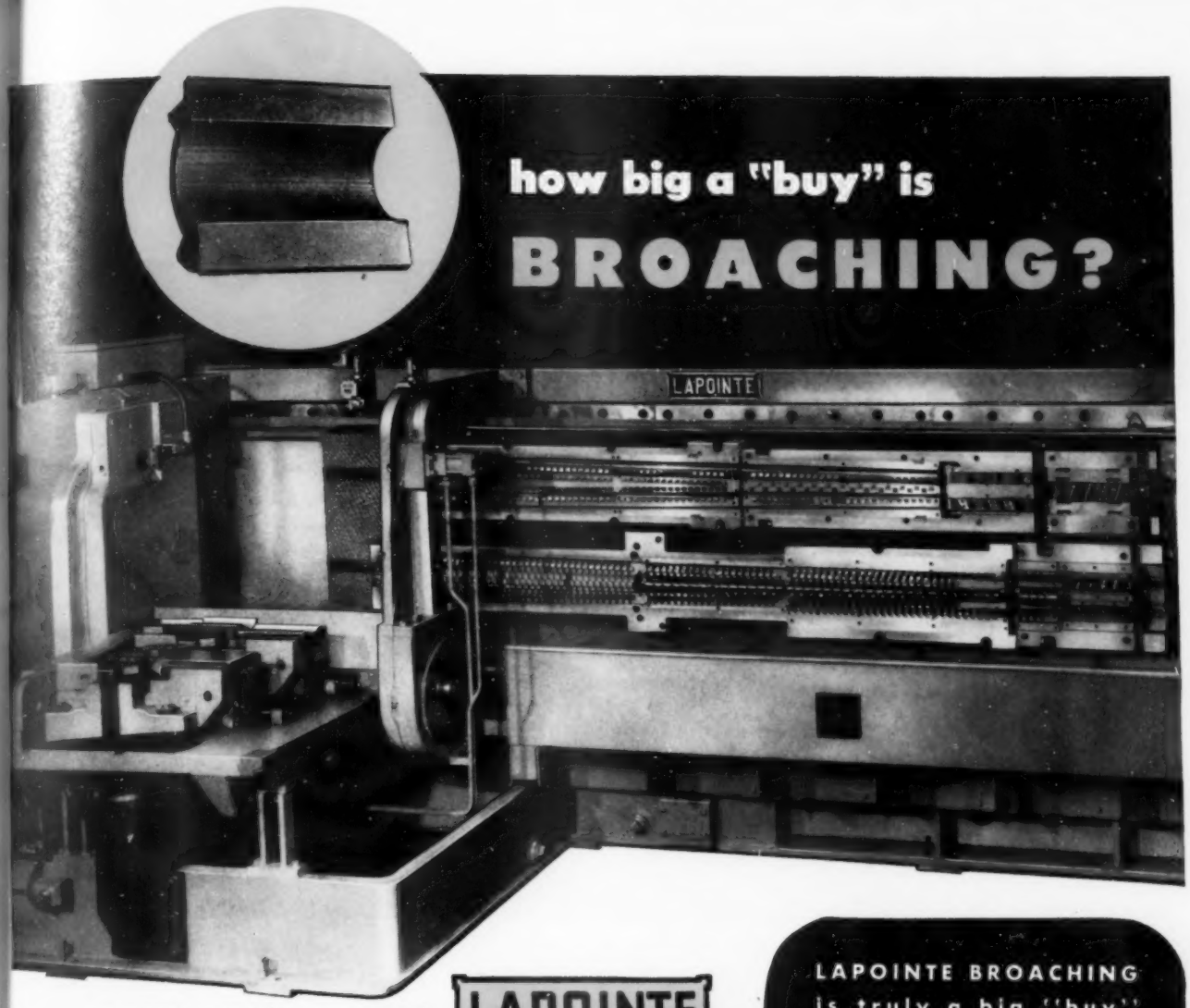
HANNIFIN "HY-POWER" RIVETING IS THE LONG-TIME STANDARD OF THE AUTOMOTIVE INDUSTRY

If you're looking for a better riveting method—whether you need one riveter or fifty—discuss it with your Hannifin representative. Meanwhile, get the full story by writing for Bulletin 150.

HANNIFIN

Air and Hydraulic Cylinders • Hydraulic Presses • Pneumatic Presses • "Hy-Power" Hydraulics • Air Control Valves

Hannifin Corporation, 519 South Wolf Road, Des Plaines, Illinois



a neat question . . . and LAPOINTE comes up with a neat answer in this amazingly smooth-operating

50 hp 120-inch stroke single ram horizontal BROACHING MACHINE with ELECTRO-MECHANICAL DRIVE

LAPOINTE BROACHING is truly a big "buy" in these days which require the utmost in production speed, the maximum ability to meet tolerance and finish specifications, and the lowest possible production costs.

Full **CARBIDE-TIPPED TOOLING** and a broaching speed up to **160 feet per minute** result in a production of 125 clusters per hour (625 individual bearing caps) completely broached in the same stroke as follows:

1st station: broach back face and boss. 2nd station: finish broach joint faces, edges, and adjacent chamfers.

Send for new bulletins on Lapointe electro-mechanical drive broaching machines:

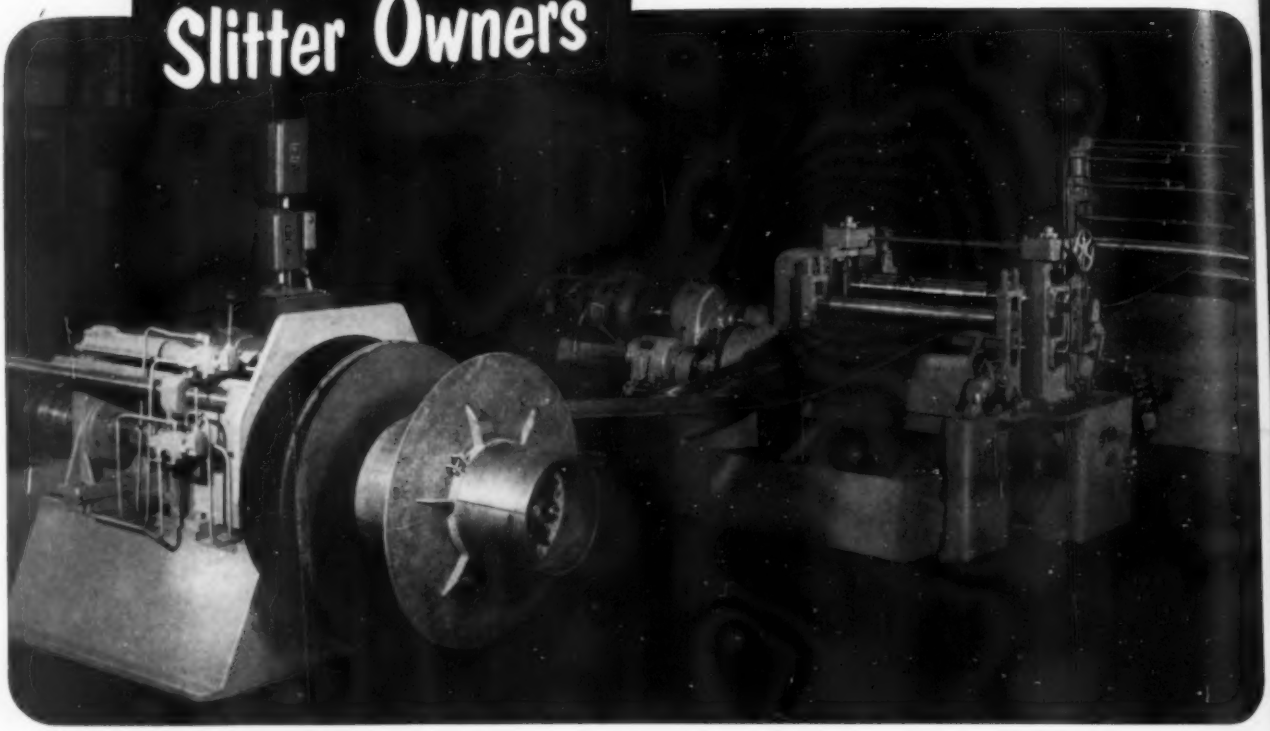
Single ram horizontal. SRHE-5

Double ram vertical, DRVE-5

THE LAPOINTE MACHINE TOOL COMPANY
HUDSON, MASSACHUSETTS • U. S. A.
In England: Watford, Hertfordshire

THE WORLD'S OLDEST AND LARGEST MANUFACTURERS OF BROACHING MACHINES AND BROACHES

Ask any number of Yoder Slitter Owners



how they like it, and you may get as many different answers, because the benefits are so many.

One manufacturer said: "Our strip inventories have been reduced by 60% and greatly simplified. Our requirements in slit strands can now be quickly met from a relatively small stock of mill-width coils." Another manufacturer remarked: "We no longer have to worry about ordering strip long in advance, complicating our production planning." A third manufacturer made this comment: "We can now buy our strip wherever we can get the best quality, price and delivery. That saves a lot of time, money and worry."

Any one of these and other benefits may in itself be sufficient to justify the investment; yet, quite aside from this, the *direct savings in slitting cost always repays the investment in a short time,* often in less than a year.

Ask for the Yoder Slitter Book. It contains cost studies, time studies, information on scrap disposal, coil handling, small versus large slitters, and many other subjects of interest to users of coiled strip and sheets.

THE YODER COMPANY
5525 Walworth Ave. • Cleveland 2, Ohio

Complete Production Lines

- ★ **COLD-ROLL-FORMING** and auxiliary machinery
- ★ **GANG SLITTING LINES** for Coils and Sheets
- ★ **PIPE and TUBE MILLS**—cold forming and welding

ENGINEERING YODER MANUFACTURING

Hold Everything . . . At the Turn of a Lever!
Brown & Sharpe Permanent Magnet Chucks give you faster, dependable chucking for a wide variety of jobs. Their powerful magnetic grip engages or disengages at the turn of a lever. Strong *permanent* magnets make holding ability completely reliable . . . immune to plant power failures. And, freedom from electric wires permits using these chucks anywhere in the shop. Rectangular Models in 8 sizes from 2½"x5" to 12"x36"; Rotary Models in 5", 7" and 9" diameters. Write for catalog containing specifications on the complete line.
Brown & Sharpe

Finished, before You Start . . .
. . . Brown & Sharpe Ground Flat Stock comes to you ready-ground to 0.001" accuracy in thickness . . . saves you time and money. In addition, careful annealing makes it easier to machine, easier on tools . . . and easier to harden.
To simplify hardening, stock is marked along entire length for quenching in "oil or water," "oil," or "water." And complete heat-treating instructions are printed on each color-coded protective envelope.
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BROWN & SHARPE MFG. CO., PROVIDENCE 1, R. I., U.S.A.
Milling Machines • Grinding Machines • Screw Machines • Cutters
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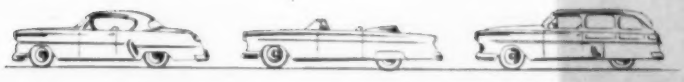
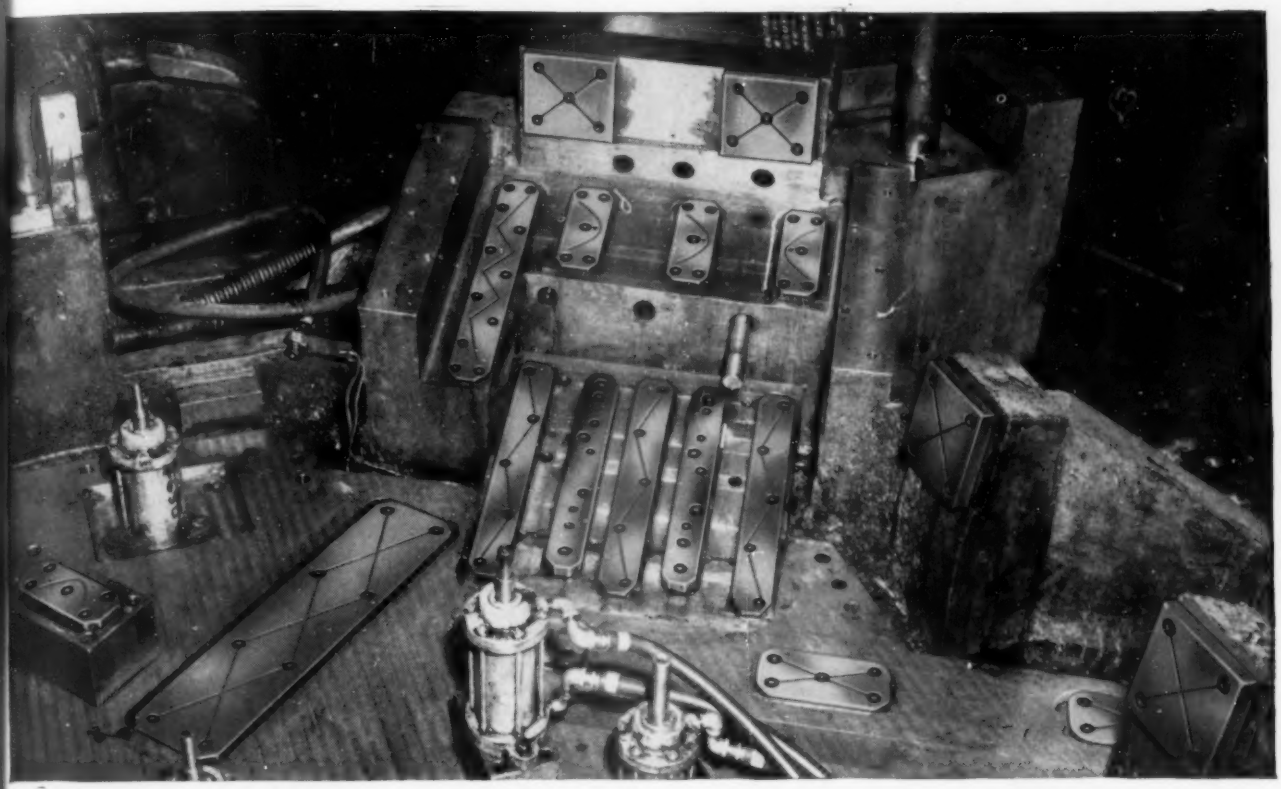
BROWN & SHARPE GROUND FLAT STOCK
OIL HARDENING or WATER HARDENING
TEMPERING CHART
ORDER BY NUMBER
730-236
1/8" x 6" x 18"
We urge buying through the Distributor

IT'S OK WHEN YOU FOLLOW THE LEADERS





The automotive industry stands as a leader in technological advancement and cost-cutting production techniques. That's why today practically every important automobile manufacturer is using Ohio Knife Aluminum Bronze Wear Plates on body dies.

By a unique cladding process, long-wearing aluminum bronze is bonded to a machinable steel base. Cost is drastically lower when compared to solid cast bronze plates. A finer quality bearing surface is obtained, resulting in longer life. When fitting is required to suit die, steel backing of plate is easily machinable, and no difficulty is encountered drilling or counter boring through bronze surface. OK aluminum bronze plates are applicable wherever a die has a sliding or cam action. A large selection of OK aluminum bronze plates carried in stock . . . finished ground, flat and parallel . . . ready to ship. Specials made to your specifications. Literature available showing our standard sizes. Write Dept. 29-U

Manufacturers for the metalworking industry of:

SLITTER KNIVES • SHEAR BLADES • BRONZE WAYS • ROTARY SHEAR KNIVES
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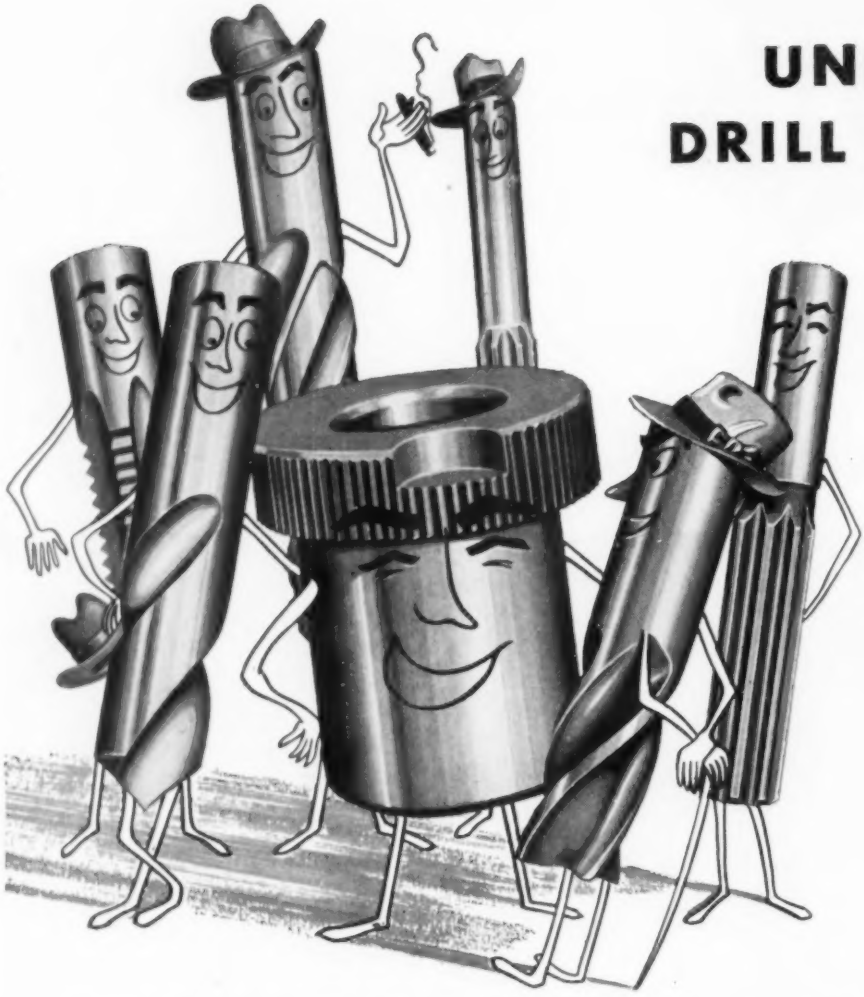
THE OHIO KNIFE CO.

CINCINNATI 23, OHIO



UNIVERSAL DRILL BUSHINGS

the production-tools' best friend

reduce tool wear
help prevent
tool breakage

prolong
tool life

Universal Bushings help keep tool costs down for several reasons: their superfinish bore helps reduce tool wear • their blended radius helps prevent tool hang-up and breakage • their 100% concentricity and hardness tests insure accuracy and uniform high quality • their knurled heads provide quick, sure grip • available in a complete range of standard diameters and lengths • orders for special dimensions will be handled promptly • For complete information, write to the office nearest you — Universal Engineering Sales Co., 1060 Broad St., Newark 2, N. J.; 5035 Sixth Avenue, Kenosha, Wis. — or the home office.

176

UNIVERSAL ENGINEERING COMPANY

FRANKENMUTH 3
MICHIGAN

(1) BORING CHUCK
(2) MIKRO-LOK BORING BAR
(3) STANDARD COLLET CHUCK
(4) FLOATING COLLET CHUCK
(5) WEDGE-LOCK PRODUCTION VISE
(6) "KWIK-SWITCH" TOOL HOLDER
(7) STANDARD DRILL BUSHING
(8) UNIVERSAL INDEX PLUNGER

Tool Steel Topics

BETHLEHEM STEEL COMPANY, BETHLEHEM, PA.

On the Pacific Coast Bethlehem products are sold by Bethlehem Pacific Coast Steel Corporation. Export Distributors: Bethlehem Steel Export Corporation

LEHIGH H DIE PRODUCES INTRICATE FLOOR-PLATE SECTION

The picture at the upper right shows the business end of a large blanking-and-forming die, used in making floor-plate sections for Flash-Stone Company, Inc., Philadelphia. The photograph below shows 11-gage sheet steel being fed into an 850-ton press, beyond operator, where it undergoes initial blanking and forming. Additional forming, plus trimming, are done in a return pass, at operator's left. Above appears the finished product, an 11¾-in. square, with numerous lugs on the top and sides for gripping the concrete.

The die, made of Lehigh H tool steel, is providing long production runs because of its good resistance to wear and shock. Redressing is seldom required.

Lehigh H is a high-carbon, high-chromium, air-hardening tool steel, well known for its easy machinability and easy heat-treatment. It's a deep-hardening steel, too, with high compressive strength.

TYPICAL ANALYSIS

Carbon	1.55	Molybdenum	0.80
Chromium	11.50	Vanadium	0.40

Like to prove to yourself how Lehigh H Tool Steel wears . . . and wears . . . and wears? Call your tool steel distributor, or write a line direct to us at Bethlehem, Pa.

Sheet steel, being fed into press for initial blanking and forming, is further formed and trimmed on the return pass into the finished floor plate, which is shown on the slide near foot of picture.

BETHLEHEM TOOL STEEL ENGINEER SAYS:

Use Distortion Tests With Care

Distortion of tool steel in heat-treatment is a phase of toolmaking which is often misunderstood. And some of the available distortion-test data adds to the confusion.

Typical of the misleading distortion tests are those on bar stock, about ¾ in. round and 1 in. long. The results are reported as the change in length occurring in the hardening heat-treatment, and certainly do tell what happens when steel of that size is hardened. But how to use this data to predict size changes of tools of other sizes? There's the rub!

The test described implies that the distortion figure for the 1-in. piece can be applied elsewhere—for example, that a 5-in. piece changes 5 times as much, and a 10-in. piece 10 times as much. Not so! Depending on the size and shape of the pieces being hardened, expansion or contraction may occur, but the factor cannot be used to predict which. Therefore the data obtained on the test piece is of limited value, as it applies only to the hardening of tools of the size and shape of the test piece itself. There is no such thing as a single test specimen which predicts size changes in tools of various sizes and shapes.

If you would like additional information on distortion, write for a copy of our article, "Distortion of Tool Steels in Heat-Treatment."

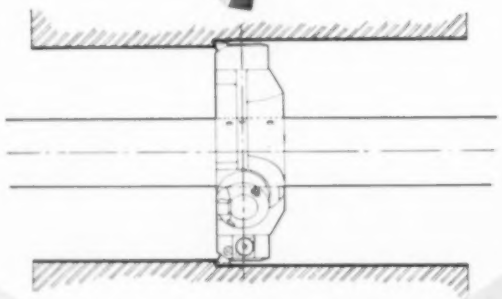
Let DAVIS cut your Boring Costs 2 ways

WITH Standard Tooling ITEMS FROM INDUSTRY'S MOST COMPLETE LINE

IN STANDARD BORING HEADS ALONE DAVIS PRODUCES AND CATALOGS OVER 133 DIFFERENT SIZES AND TYPES.

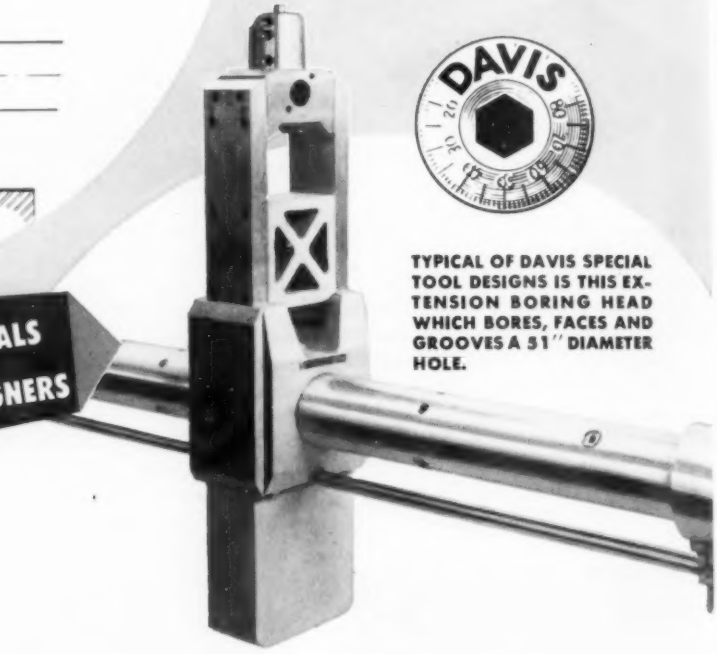
Every boring job in your shop...regardless of range, material or complexity...can be done faster, cheaper and with greater precision, when you make Davis your tooling headquarters. That's because only Davis has both the complete line and broad machining experience to supply or design exactly the right tool for your work.

Davis tooling specialists help you immeasurably in selecting the right tool from industry's broadest standard line. Their unrivalled background of practical shop experience assures recommendations that exactly meet all your requirements for tolerances, finish, speeds, feeds and maximum tool life at minimum cost.

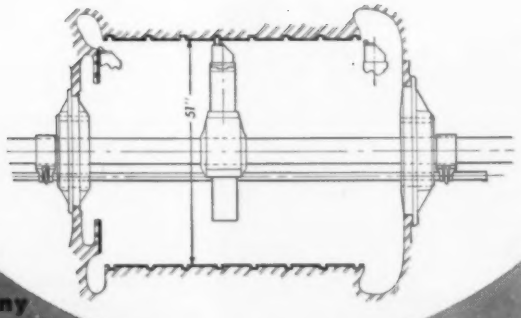


WITH Job-Engineered SPECIALS FROM INDUSTRY'S FOREMOST DESIGNERS

TYPICAL OF DAVIS SPECIAL TOOL DESIGNS IS THIS EXTENSION BORING HEAD WHICH BORES, FACES AND GROOVES A 51" DIAMETER HOLE.



Where work is beyond the scope of standard tools or where efficiency can be improved or costs reduced by combined operations, special fixturing, etc., the specialists in Davis Engineered Tooling Service will work with you in developing tools for even the most complex application. Consult your local Davis field engineer or send us complete work details for impartial recommendations.



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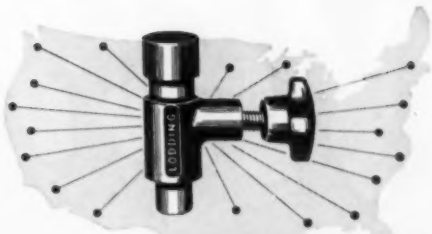

Completely stocked coast-to-coast distributors provide immediate shipment of parts like this spring jack — you get them much faster than you can make them yourself!

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YOU GET WHAT YOU WANT

Here at Lodding you will find the most complete line of standard assemblies and details offered by anyone — all the components necessary to standardize your engineering practice, save design and labor costs.

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All Lodding fixtures are carefully engineered and quality-built to provide long, reliable service. Forgings and powdered metal are used in many cases. Every Lodding fixture is Parkerized to prevent rust.

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INC.

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THE STANDARD LINE
OF JIG AND FIXTURE COMPONENTS

NEW! Automatic Multi-Cycle Tracer Control for SUNDSTRAND Automatic Lathes*

Gives Ruff, Semi-Finish and Finish Cuts in ONE AUTOMATIC CYCLE

You can now obtain Sundstrand Automatic Lathes with tracer control for multi-cycle single point turning of irregular shapes. The lathes can be provided with a template controlled tracing slide mounted to the regular front carriage.

With this attachment and controls, ruff, semi-finish and finish cuts can be taken with one turning tool in one automatic cycle. The control can be set up for one, two or three cycles depending on job requirements. The regular cross feeding rear slide can be used to square up shoulders, chamfer, etc. Cycle changing is quick and easy requiring only 5 to 15 minutes depending on the number of facing tools required in the job set-up.

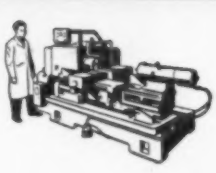
* This attachment is available for factory installation only on new Sundstrand Automatic Lathes.

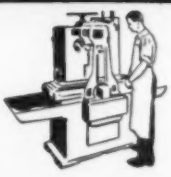
SUNDSTRAND

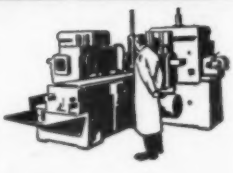
"Engineered Production" Service*

*REG. U.S. PAT. OFF.

AUTOMATIC LATHES | SIMPLEX RIGIDMILS | DUPLEX RIGIDMILS





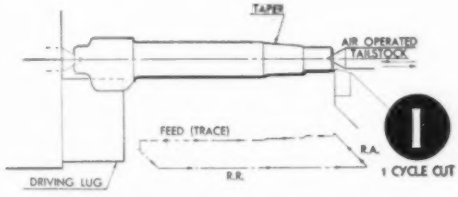


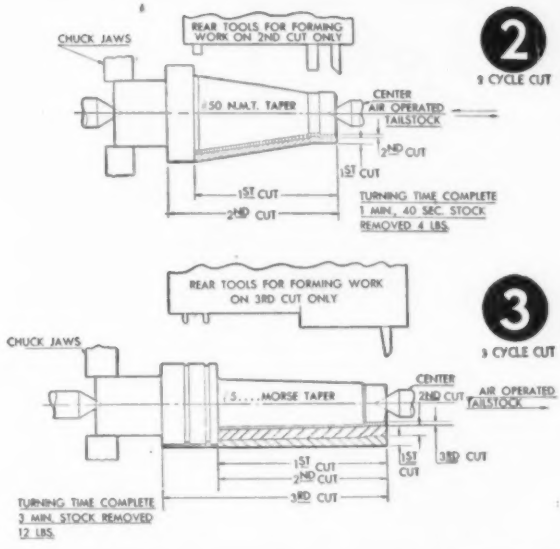
For Parts Like These

Illustrated at the right are typical parts that can be turned on a Sundstrand Automatic Lathe with the new Sundstrand Multi-Cycle Tracer Control. The pinions, stub arbors and universal joint parts illustrated are just a few of many that can be turned efficiently on this equipment. The diameters and tapers are turned with simple single point tools. Small lots or large can be handled easily and quickly.

Typical Tooling

These sketches illustrate stock removal and tooling for a one cut, two cut or three cut job. The lengths and depths of the first, second and third turning cuts and the cross feed of the rear slide are automatic and part of the machine cycle. Changing over to a different job is easily done in a matter of minutes.





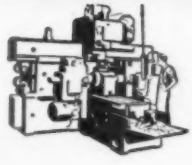
Features

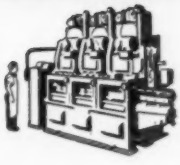
1. Easily changed over for different jobs. 2. One template for all three cuts. 3. Change-over time to standard operation approximately 45 minutes. 4. Three turning cuts in one automatic cycle. 5. Cross feeding rear slide operates in automatic cycle for facing, grooving, chamfering, etc. 6. Because of the complete automatic cycle one operator can run several machines.

Free Data

Additional information is available in this new folder. Write for your copy today. Ask for bulletin No. 749.

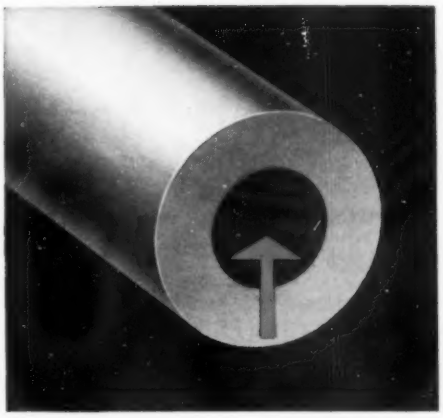
TRIPLEX RIGIDMILS | SPECIAL MACHINES





SUNDSTRAND
Machine Tool Co.
2540 Eleventh St. • Rockford, Ill., U.S.A.

a hole here is a nuisance...



a hole here is an advantage

Crucible Hollow Tool Steel Bars are saving time and money for more and more members of the metalworking industry. By using these hollow bars you eliminate drilling and boring operations, increase machine capacity and cut scrap losses.

Now, you can get hollow bars of any of Crucible's famous tool steel grades, in almost any combination of O.D. and I.D. sizes. And you can get *immediate* delivery of five popular grades from your local Crucible warehouse—KETOS® oil-hardening, SANDERSON® water-hardening, AIRDI 150® high carbon—high chromium, AIRKOOL® air-hardening, and NU DIE V® hot-work tool steels.

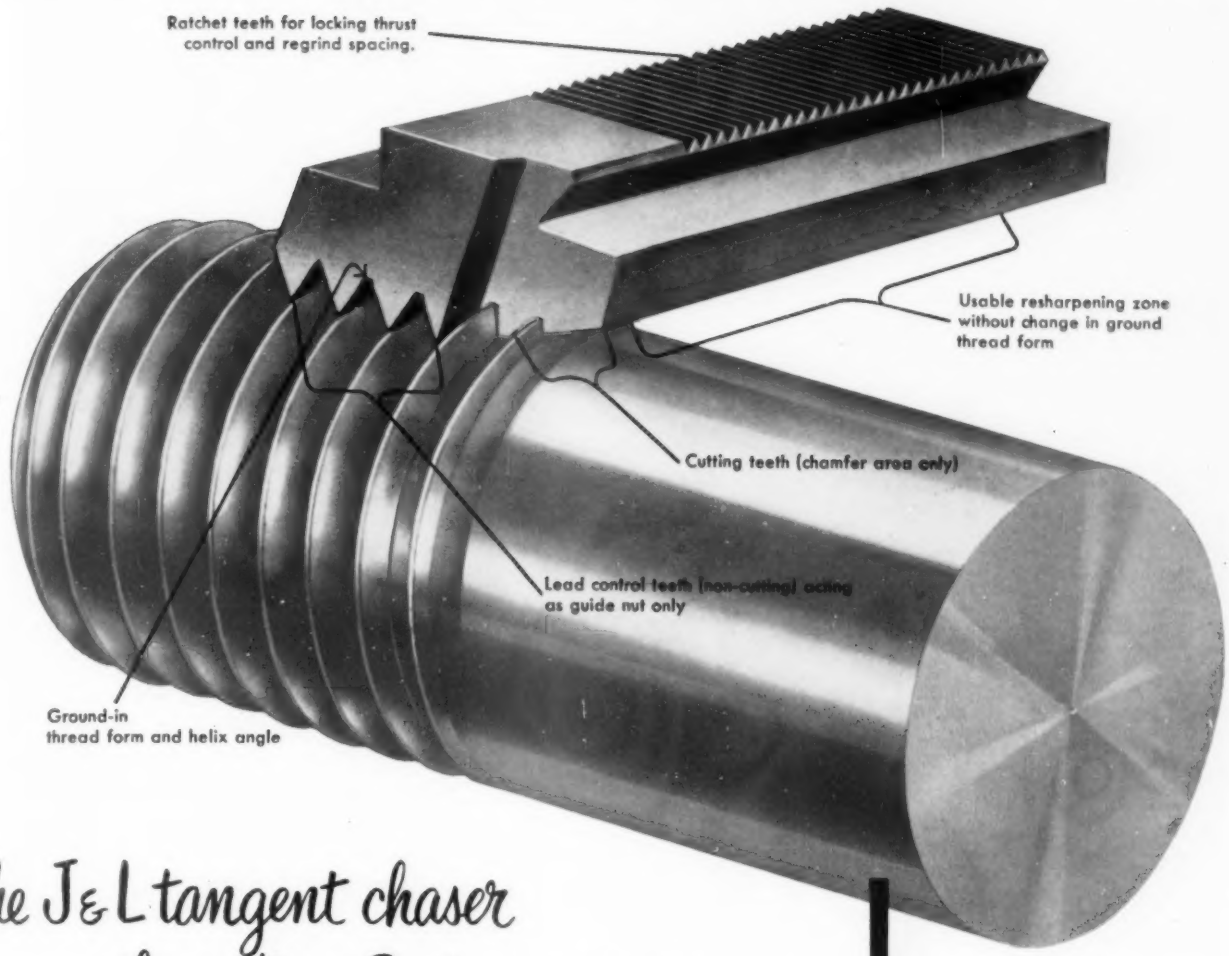
Your Crucible representative can point out ways to save time and money by using Crucible Hollow Tool Steel Bars.

CRUCIBLE first name in special purpose steels

54 years of Fine steelmaking

HOLLOW TOOL STEEL

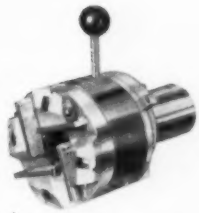
CRUCIBLE STEEL COMPANY OF AMERICA • TOOL STEEL SALES • SYRACUSE, N. Y.


Ratchet teeth for locking thrust control and regrind spacing.
Usable resharpening zone without change in ground thread form
Cutting teeth (chamfer area only)
Lead control teeth (non-cutting) acting as guide nut only
Ground-in thread form and helix angle

the J&L tangent chaser threading System assures...

... ease of operation ... maximum accuracy and tool economy — by means of a true tangent method of thread cutting exclusively developed by Jones & Lamson.

All four chasers in the set are positioned tangent to the work, making them cut like any other end cutting form tool. J&L tangent chasers have the thread form ground in at the exact helix angle for the size and pitch being threaded. Cutting action is confined to the chamfered area and the first full tooth in a set. The non-cutting teeth, purposely end ground above center, act as a precision lead nut. The non-cutting teeth on all four chasers act as a steady-rest and help control the lead with extreme accuracy. Class III guaranteed. *This means important savings regardless of your tolerance requirements.*



Tangent Stationary Type
Capacities from #4 to 2"

Tangent Revolving Type
Capacities from #4 to 2"

Brown & Sharpe Types, capacities #0-1¼" — for #0 & #2 B&S machines & small turret lathes.

J&L Automatic Opening Die Heads and Chasers assure low initial cost — ease of operation — controlled resharpening — use of carbide where applicable. Class III threads guaranteed.

Write for free copy of *new* Jones & Lamson Tangent Die Head OPERATOR'S MANUAL.

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Starrett® *announces*

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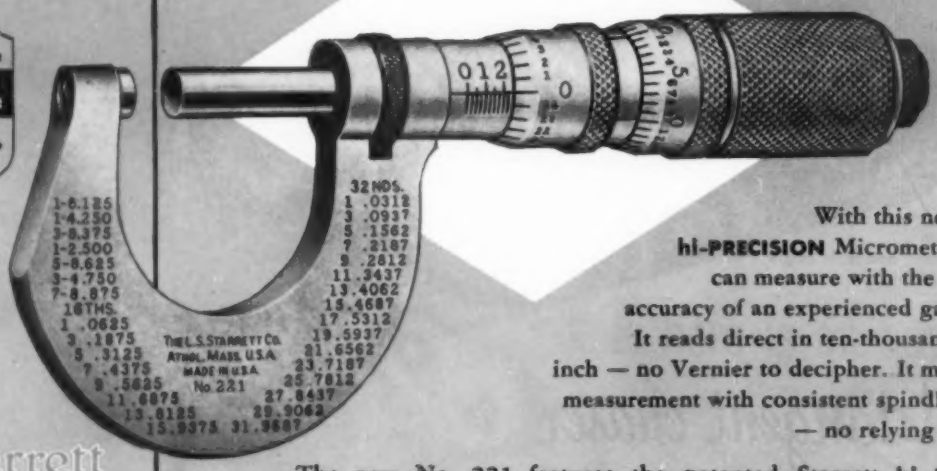
READS DIRECT IN TEN-THOUSANDTHS

WITH AUTOMATIC SPINDLE PRESSURE CONTROL



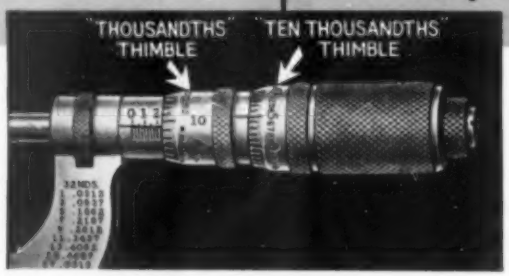
Buy THROUGH YOUR INDUSTRIAL DISTRIBUTOR
Prompt delivery
Dependable service
Quality products

With this new Starrett **hi-PRECISION** Micrometer, anyone can measure with the speed and accuracy of an experienced gage-maker. It reads direct in ten-thousandths of an inch — no Vernier to decipher. It makes every measurement with consistent spindle pressure — no relying on "feel".

Starrett
No. 221
hi-PRECISION
OUTSIDE MICROMETER CALIPER
Range 0-1" by .0001"

The new No. 221 features the patented Starrett **hi-PRECISION** thimble with direct reading ten-thousandths graduations plus an exclusive constant-pressure mechanism which automatically insures exact spindle pressure on every measurement. Use it for faster measuring at top accuracy, for inspection and quality control applications and for all precision measuring requiring consistent, high precision.

The new Starrett No. 221 **hi-PRECISION** Micrometer is now available as a 0 to 1 inch outside caliper. Ask your industrial distributor to demonstrate its advantages and superior accuracy . . . or write for complete information. Address Dept.



DIRECT TEN-THOUSANDTHS READINGS

The patented Starrett **hi-PRECISION** Micrometer features *dual thimbles.* The inner thimble with every thousandth numbered for positive identification is used to read thousandths in the conventional way. The outer thimble with large, widely spaced, numbered graduations gives direct readings in ten-thousandths.

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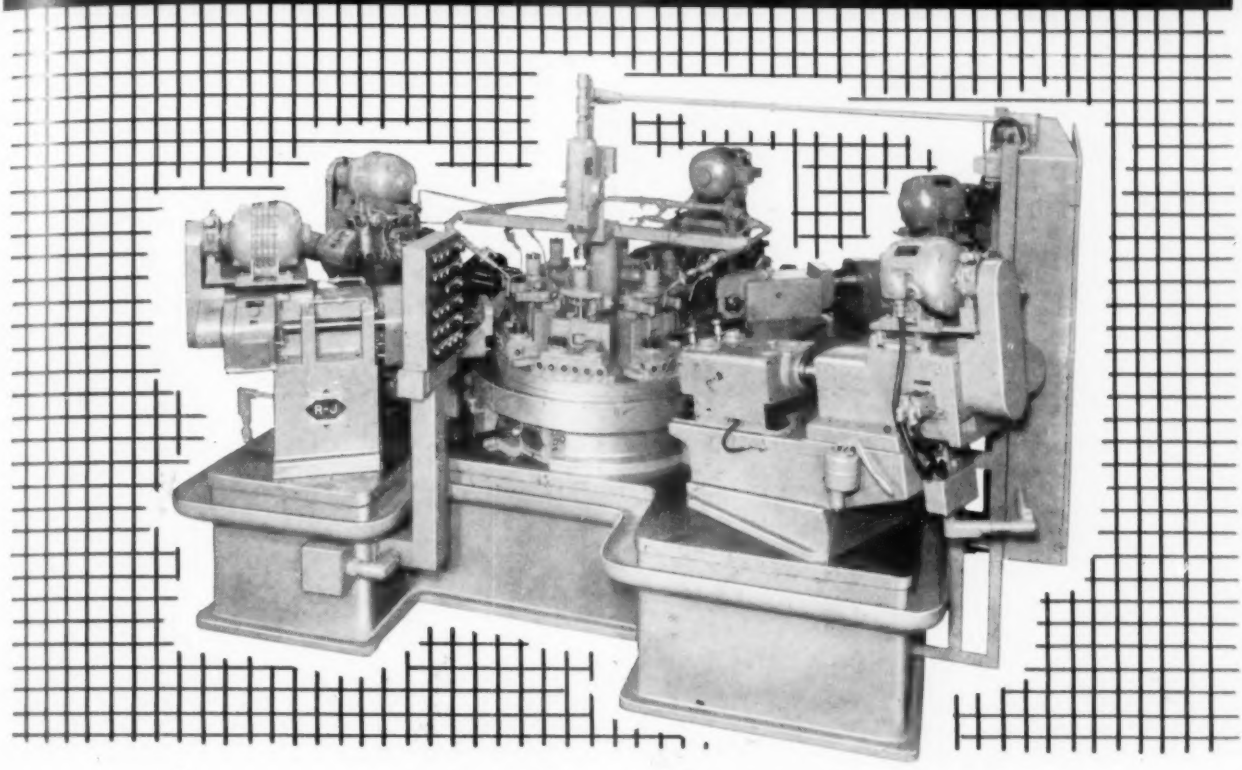
Rehnberg-Jacobson



12 DRILLED HOLES and 4 SAWED SLOTS in 327 AUTO ENGINE PISTONS per HOUR

This is the piston, from a well-known new automobile engine, which has expansion slots in the skirt that are cut on the machine shown above. Rated production is 327 pieces per hour.

While most of the operations on automobile parts are standard in nature, there are a few cuts that might be called "different." One of these is the milling of expansion slots in piston skirts, as illustrated here. We recently delivered a machine, shown above, which handles this job rapidly and efficiently. The machine is an uncomplicated one, as can be seen, consisting of an automatic ALL-MECHANICAL Rim-Ball Index Unit surrounded by five ALL-MECHANICAL R-J Drilling Units and Milling Units for the necessary drilling and sawing. The fixtures are of the A/B type where the piston is turned 180° and sent around again in the second position to machine the other side. Fast-acting, automatic, power-operated clamping and unclamping of the fixtures helps the operator to unload, switch, and load the parts in the short 11-second cycle period. In addition to 4 clearance holes for the sawed slots, the machine drills 4 odd oil holes into the wrist pin bushings, and 4 smoke holes in the bottom ring slot. *If you have work of any comparable nature, let us quote on your needs.*

REHNBERG-JACOBSON MFG. COMPANY

DESIGNERS & BUILDERS OF SPECIAL MACHINERY

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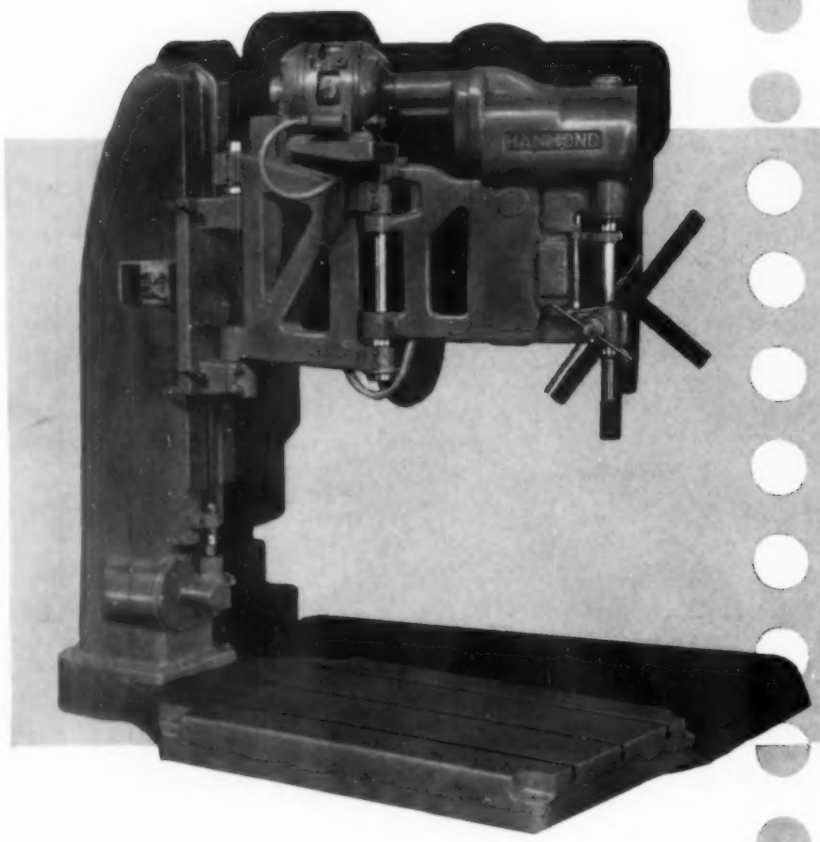
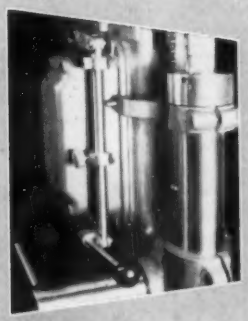
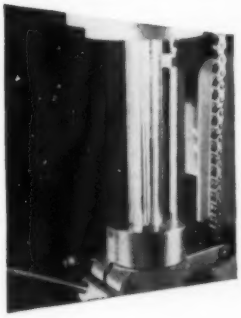
ROCKFORD, ILLINOIS

FOOTBURT

for faster radial drilling and tapping







Hammond Radial Drilling and Tapping Machines may be spotted in the production line for drilling, tapping or reaming. With its unique Bracket Type construction the spindle can be swung quickly from hole to hole. Six Quick Speed Changes are instantly available and the Hammond Tapping Reverse is very fast and convenient to operate.

THE FOOTE-BURT COMPANY

Cleveland 8, Ohio

Detroit Office: General Motors Building

engineered for production

FOOTBURT

MACHINE TOOLS

Whatever kind of gears you make...
Whatever way you make them

National Tool Co.

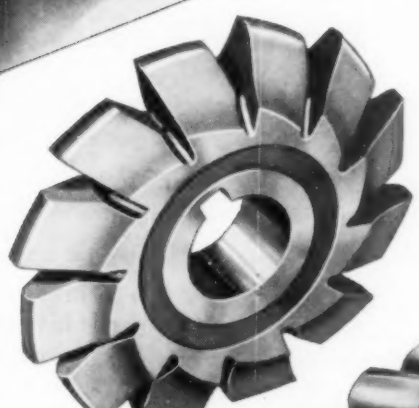
can supply the right type cutting tool
because we make *all* types

tional Tool Co., with 50 years perience in the manufacture of cial cutting tools, makes *all* ieties of gear cutting tools for types of spur, helical and worm ars—as well as for sprockets splines. Whatever your gear uirements—large or small—ional engineers can help you ide the most efficient method producing them. Many gear ufacturers have found it profit- le to look to National Tool Co. all their gear cutting tool re- ements.

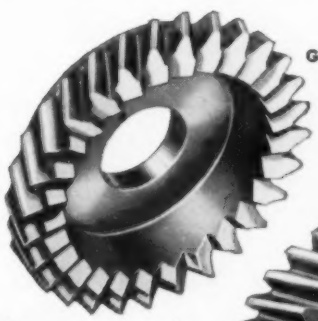
Gear Shaving Cutters

Hobs

Rack Type Gear Shaper Cutters

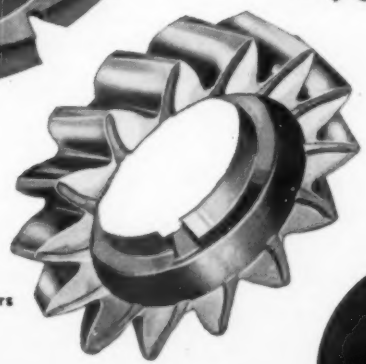


Involute Gear Cutters



Gear Shaper Cutters

Master Gears



Herringbone Gear Cutters

Representatives in major industrial centers

National Tools Cleveland

National
TOOL CO.
Cleveland 2, Ohio

We Built a Reputation...

PRATT & WHITNEY KELLER

Automatic Tracer-Controlled Milling MACHINES

are now FASTER, MORE EFFICIENT than ever before

With a work area of 36" x 20", the Type BL Keller is ideal for a wide variety of smaller jobs. Both single and 3-spindle models are manufactured. Other Keller Machines accommodate practically any required work size up to 20 feet horizontally by 7 feet vertically.

"KELLERING" *means...*

Throughout industry, use of the P&W KELLER MACHINE to produce complex 2- and 3-dimensional forms by tracer-controlled milling has become so popular and so widespread that this type of machining is universally known as "Kellering."

Yes, we at Pratt & Whitney are proud of this recognition and reputation. But we also know that reputation and past performance ***alone*** aren't enough to insure ***your*** continued profitable operation in the face of increasingly competitive markets and constantly rising production costs.

For this reason, we have carried on a program of continuous research, development and improvement. As a result, P&W Keller Machines — always outstanding performers — now offer the increased speeds, feeds and inbuilt efficiency to meet today's demands for still greater productivity. In many applications, actual on-the-job performance has proved that Keller Machines are ***now more than twice as fast*** as older machines or older methods.

- FAST, ECONOMICAL REPRODUCTION OF COMPLEX SHAPES . . . that cannot be machined economically by any other means.

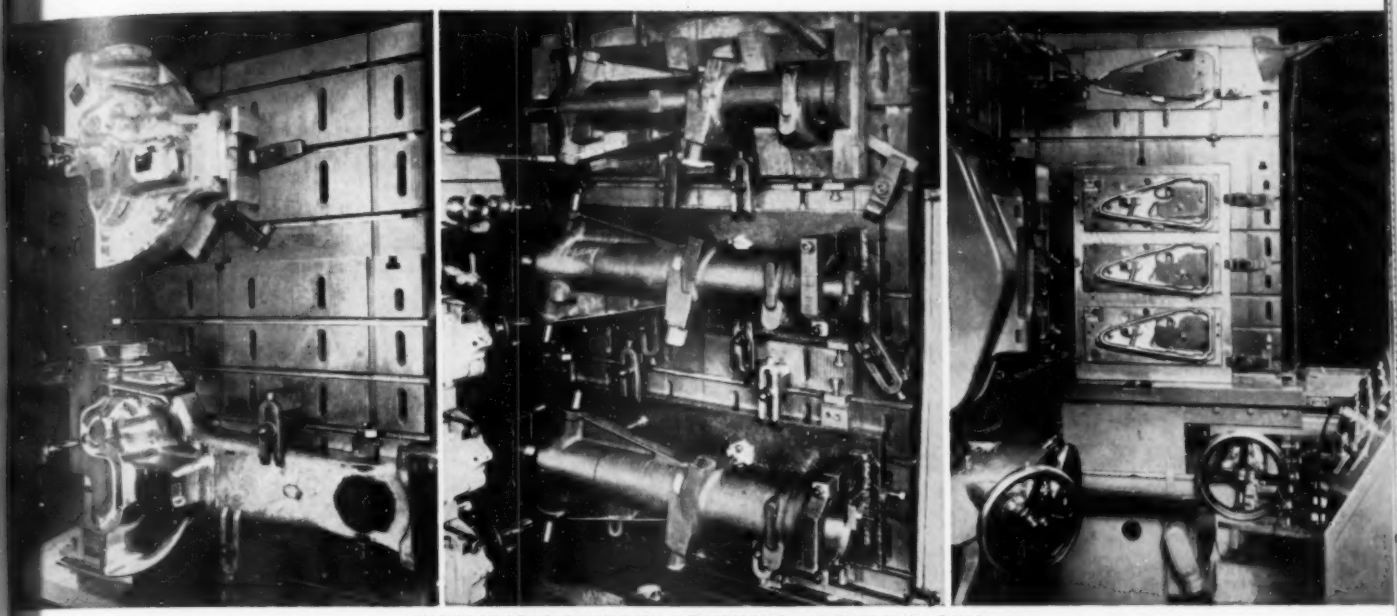
- AN UNLIMITED VARIETY OF JOBS WITHOUT EXPENSIVE ATTACHMENTS . . . because P&W Keller Machines are designed and built *specifically* for tracer-controlled milling, not just adapted.

- RUGGED DEPENDABILITY . . . Kellers stay on the job year after year without frequent or expensive maintenance.

- ELECTRIC TRACER CONTROL . . . that is dependable, relatively simple, retains high initial accuracy without complicated adjustment. ***Profiling*** to a pre-set depth following an outline template . . . or ***3-dimensional milling*** following a full model.

...but We're Not Resting on it!

ALL THESE JOBS . . . DONE QUICKER, BETTER



PHOTOGRAPHS COURTESY OF MPM INC., CLEVELAND, OHIO.

DIES, MOLDS AND METAL PATTERNS

The complex 3-dimensional shape of a plaster model is duplicated in a large brass casting to produce a pattern for a railroad coupling. Using only one of its 3 spindles, the Keller Machine easily accommodates this large workpiece.

PROTOTYPE AND PILOT PRODUCTION

Producing parts for aircraft landing gear, this P&W Keller Machine mills two steel forgings simultaneously. The exact shape of the mahogany model shown at the top is accurately duplicated with speed and economy.

PRODUCTION MILLING AND PROFILING

Precision profiling 3 aluminum alloy castings at a time, this P&W Keller 3-Spindle Machine economically makes production runs on aircraft ribs. The model, in this case, is an inexpensive, 2-dimensional steel template.

Maintaining Your Reputation

. . . and your profits demands constant progress and improvement with a well conceived program of replacement and modernization. Plan to include ***new*** P&W Keller Machines in your program . . . benefit by the added productivity they can bring to today's *and* tomorrow's jobs. Write to the P&W Branch Office nearest you . . . or direct to West Hartford . . . for your free copy of Circular No. 490-3 that fully describes the Type BL Keller Machine.

MODERNIZE with PRATT & WHITNEY REPLACE FOR PROFIT

PRATT & WHITNEY

DIVISION NILES-BEMENT-POND COMPANY

WEST HARTFORD 1, CONNECTICUT, U. S. A.

SINCE 1860

First Choice P&W *for Accuracy*

Branch Offices . . . BIRMINGHAM • BOSTON • CHICAGO • CINCINNATI • CLEVELAND • DALLAS (The Stanco Co.) • DETROIT • HOUSTON (The Stanco Co.) LOS ANGELES • NEW YORK • PHILADELPHIA • PITTSBURGH • ROCHESTER • SAN FRANCISCO • ST. LOUIS • EXPORT DEPT., WEST HARTFORD

MACHINE TOOLS • CUTTING TOOLS • GAGES

BUY PERFORMANCE

... it's WORTH the Price!

THE TRUE VALUE OF A GRINDING WHEEL is measured by the quality and quantity of the *grinding* it does . . . not by its price.

This real value can be determined only by finding the cost per pound of stock removed and checking the accuracy and finish of the surface left on the work.

Judge BAY STATE "WHEELS OF PROGRESS" on this basis. You'll find that their *exact* specification and consistent cool-cutting characteristics produce longer, more useful life . . . that keeps *real* grinding costs at a minimum.

BAY STATE'S Factory or Distributor Representatives will be glad to show you how "WHEELS OF PROGRESS" can bring about reductions in *your* true grinding costs.

BAY STATE WHEELS of PROGRESS

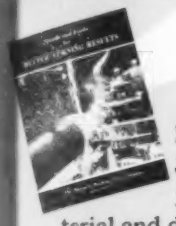
BAY STATE ABRASIVE PRODUCTS CO., Westboro, Mass., U. S. A.

Branch Offices and Warehouses — Chicago, Cleveland, Detroit, Pittsburgh
Distributors — All principal cities
In Canada: Bay State Abrasive Products Co. (Canada) Ltd., Brantford, Ont.

Ask for BAY STATE'S "On-The-Job" Engineering Service.

Manufacturers of all types of Quality Abrasive Products

Do YOU Know What WE Know About Speeds and Feeds?



Let us tell you! *This new Monarch Speeds and Feeds Booklet will better your production.* It's full of basic material and data on all commonly turned materials —invaluable information for production men and lathe operators; for engineers, foremen and methods departments.

This new report from the continuing Monarch machinability research program is a valuable tool that you'll want to put in the appropriate hands in your organization without delay. A copy is yours, without cost, as a Monarch service.

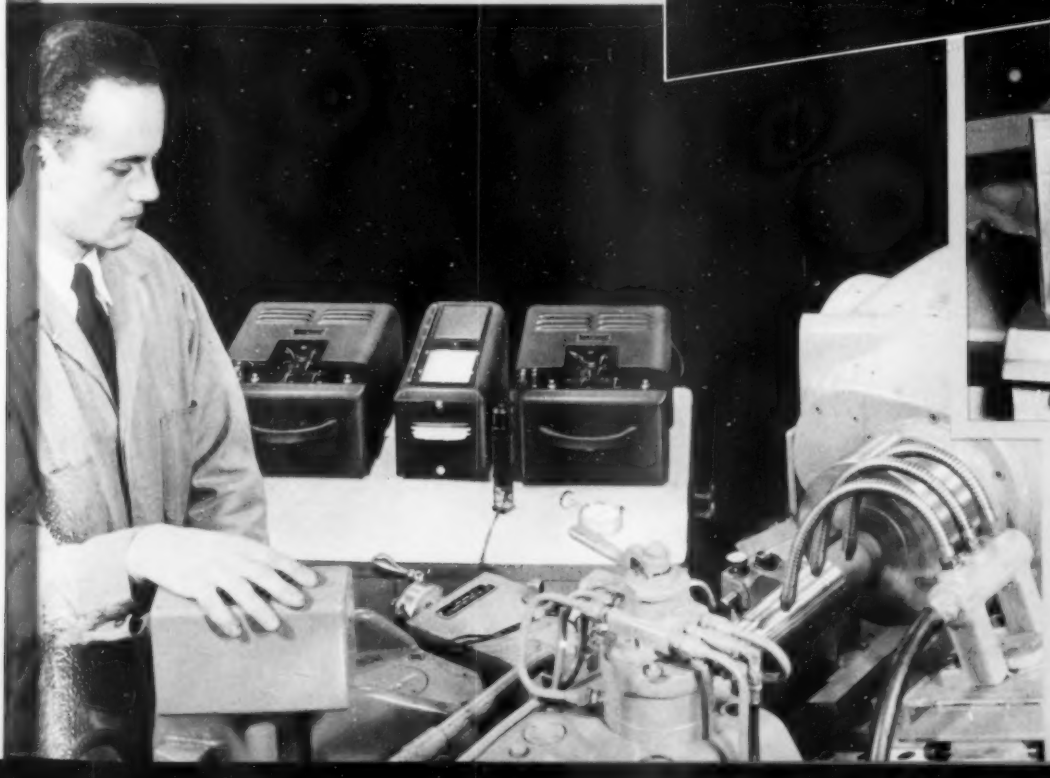
Monarch

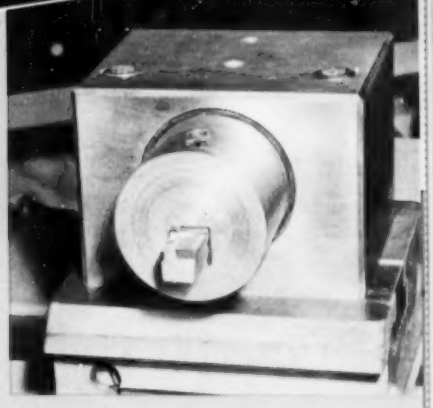
ACCURACY • ECONOMY • LONG LIFE

TURNING MACHINES

FOR A GOOD TURN FASTER . . . TURN TO MONARCH

See Next Page For Details





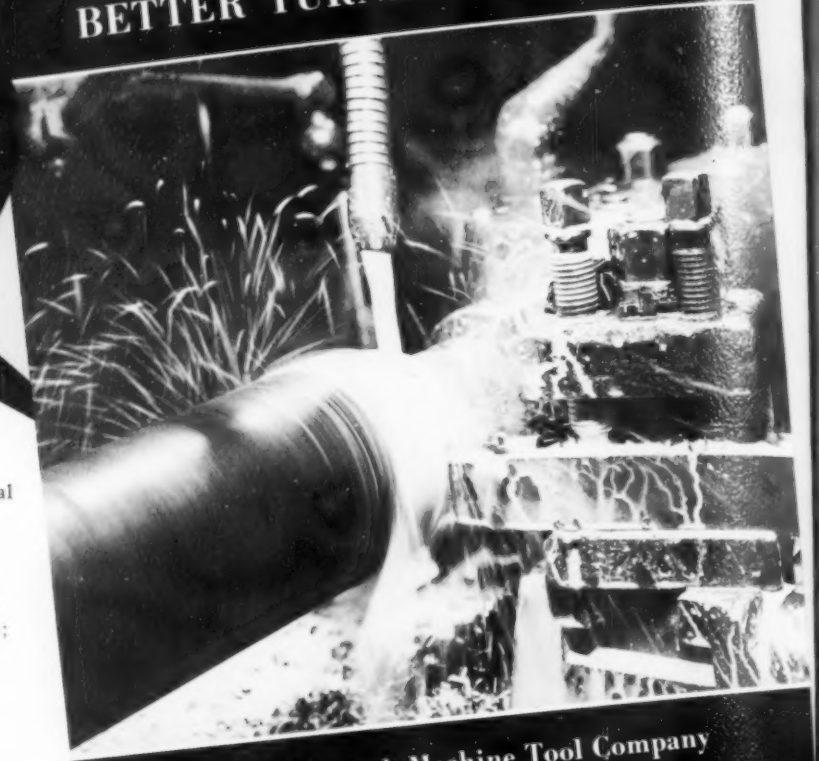
▲ Close-up of Dynamometer Used in Monarch Tests.

◀ Monarch Machinability Test Lathe in Action, With Typical Instrumentation.

The last word in turning–

Fresh off the Press!

Speeds and Feeds for BETTER TURNING RESULTS



The Monarch Machine Tool Company
Sidney, Ohio U.S.A.

PARTIAL LIST OF CONTENTS

SUBJECTS—Tool Angles; Machinability Ratings; Speed and Feed Charts; General Practice; Coolant; Horsepower.

MATERIALS—These subjects are discussed as pertinent to: Plain and Carbon Alloy Steels; Tool Steels; Stainless Steels; Heat Resistant Alloys; Cast Iron; Nickel Alloys; Copper Alloys; Aluminum Alloys; Magnesium Alloys; Plastics.

TECHNICAL CUTTING DATA—TABLES

WHAT IT IS. This book tells *you* what our studies tell *us* about the basic facts of turning. No complete technical operations handbook, its primary purpose is to serve as your guide in establishing optimum machining conditions. Much of this information is original and available nowhere else. What information has been distilled from other sources has been re-evaluated from our own findings under down-to-earth shop conditions.

ITS SOURCE. The Continuing Monarch Machinability Research Program.

This project has been in operation for some years, under the supervision of full-time recognized specialists drawing on all Monarch facilities (see preceding page). Its scope consists of the continuing evaluation of *all machining factors* which have a bearing on getting the maximum practical output from carbide cutting tools.

ITS PURPOSE. With its facts, this booklet will guide you to better, more profitable turning practice, regardless of your equipment. Or, with Monarch lathes featuring single point turning and tracer controls, you'll get *from* your lathe all the productivity we build *into* it—and that's optimum productivity . . . *The Monarch Machine Tool Company, Sidney, Ohio.*

To Get Your Free Copy **of the Monarch *Speeds and Feeds* Booklet, FILL OUT THIS COUPON and attach it to your business letterhead.**

THE MONARCH MACHINE TOOL COMPANY, Sidney, Ohio

Gentlemen: I would like a copy of your Speeds and Feeds Booklet. Please send it to me without obligation.

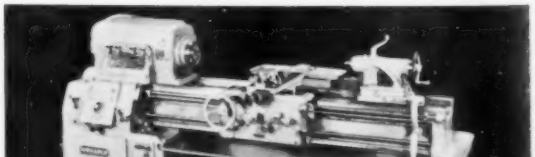
NAME _____ TITLE _____

COMPANY _____

ADDRESS _____

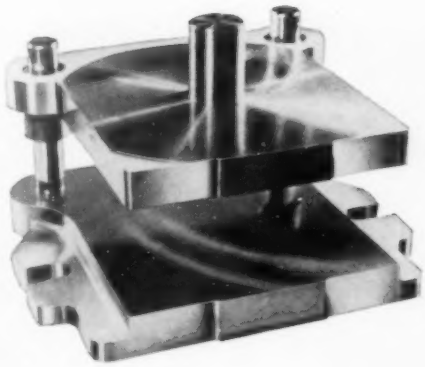
CITY _____ ZONE _____ STATE _____

Monarch
TURNING MACHINES
FOR A GOOD TURN FASTER . . . TURN TO MONARCH

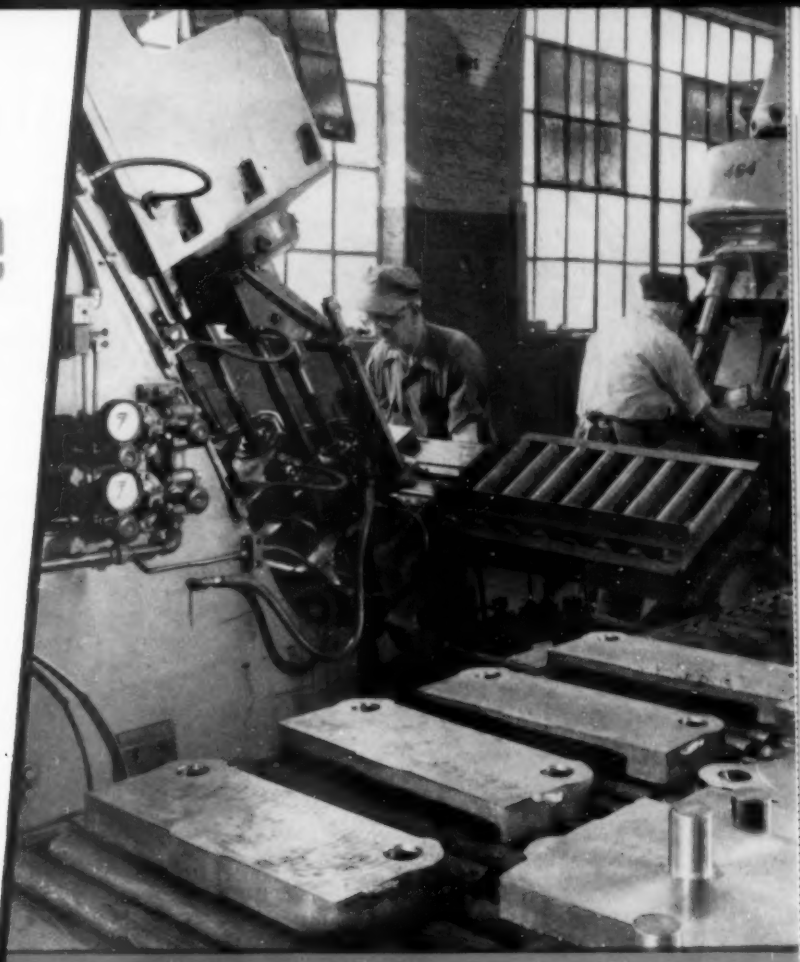


See This New Monarch Line—Series 61. First and only complete lathe line with apron-controlled 4-way power rapid traverse.

Fastest
set service
ever



. . . made possible by Danly's unique mass-production and distribution system.



At the main Danly plant . . . high speed precision drilling. Interchangeable fixtures accommodate the full range of standard die set sizes.

At your Danly Branch plant . . . shipping die sets to your order. Up-to-date procedures and facilities assure fastest delivery.

To make your tooling program move faster, Danly mass produces interchangeable, precision die set parts . . . stocks them at your local Danly Branch ready for quick assembly to your order and delivery to you. With Danly, from the time you place your order until the set is delivered to you is a matter of only a few days. This extra fast delivery starts at the main Danly plant in Chicago where two complete high-speed production lines turn out a wide variety of precision die set parts. Held in ample stock by your local Danly Branch, these interchangeable parts are assembled to your order and delivered immediately. Don't let lagging die set delivery bog down *your* tooling program. Order from your Danly Branch and get the fastest service . . . ever.

DANLY®

DANLY MACHINE SPECIALTIES, INC.
2100 South Laramie Avenue
Chicago 50, Illinois

Fast, nationwide delivery from these branch plants

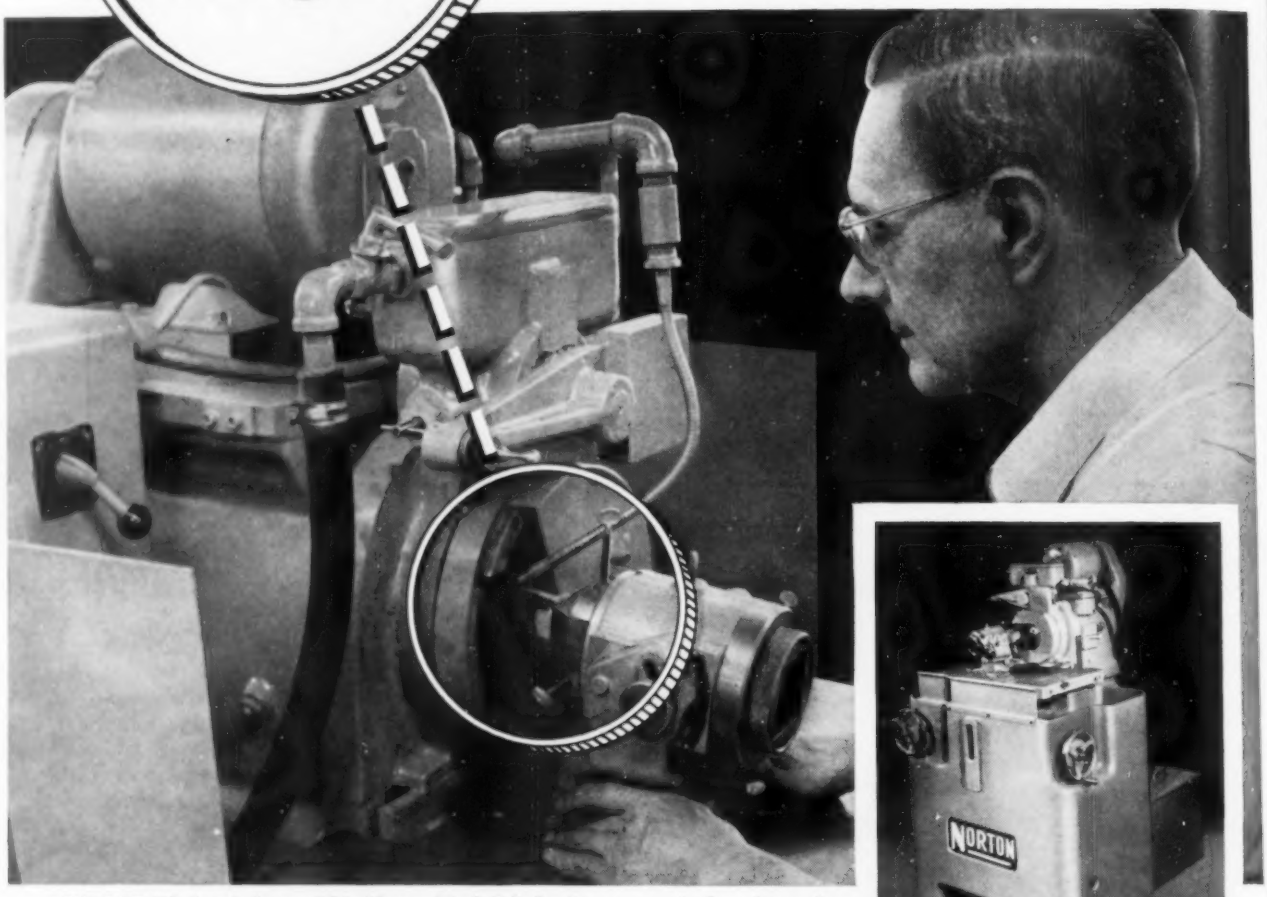
*CHICAGO 50	2100 South Laramie Avenue
*CLEVELAND 14	1550 East 33rd Street
*DAYTON 7	3196 Delphos Avenue
*DETROIT 16	1549 Temple Avenue
*GRAND RAPIDS	113 Michigan Street N.W.
INDIANAPOLIS 4	5 West 10th Street
*LONG ISLAND CITY 1	47-28 37th Street
*LOS ANGELES 54	Ducommun Metals & Supply Co., 4890 South Alameda
MILWAUKEE 2	111 East Wisconsin Avenue
*PHILADELPHIA 40	511 W. Courtland Street
*ROCHESTER 6	33 Rutter Street

*Indicates complete stock

Unequalled

for carbide tool sharpening, the Norton No. 2 Bura-Way Grinder...

makes tools last longer



BURA-WAY does it better. This Norton Tool Grinder for convex single point and form tools: (1) generates, reproduces and maintains relief angles *constant in the direction of feed*, providing uniform support to the cutting edge and; (2) insures exact duplicates of the master tool form.

When your operator sharpens your carbide-tipped tools on the Norton No. 2 BURA-WAY Grinder he adds longer life value to these tools, helping you to make more profit and turn out better products for your customers.

Precise Duplicates Every Time

In the BURA-WAY No. 2 you have the ideal tool grinder. The BURA-WAY method increases tool life and gives you more pieces per sharpening. By exact duplication of the master tool, tremendous additional benefits may be realized from an effective tool control system and reduced set up time when changing tools.

Find Out More

Get in touch with your Norton representative whose knowledge and experience is further supplemented by Norton trained engineers. Only Norton offers you such long experience in both grinding machines and wheels to help you produce more at lower cost.

Write NORTON COMPANY, Machine Division, Worcester 6, Massachusetts.

To Economize, Modernize With NEW

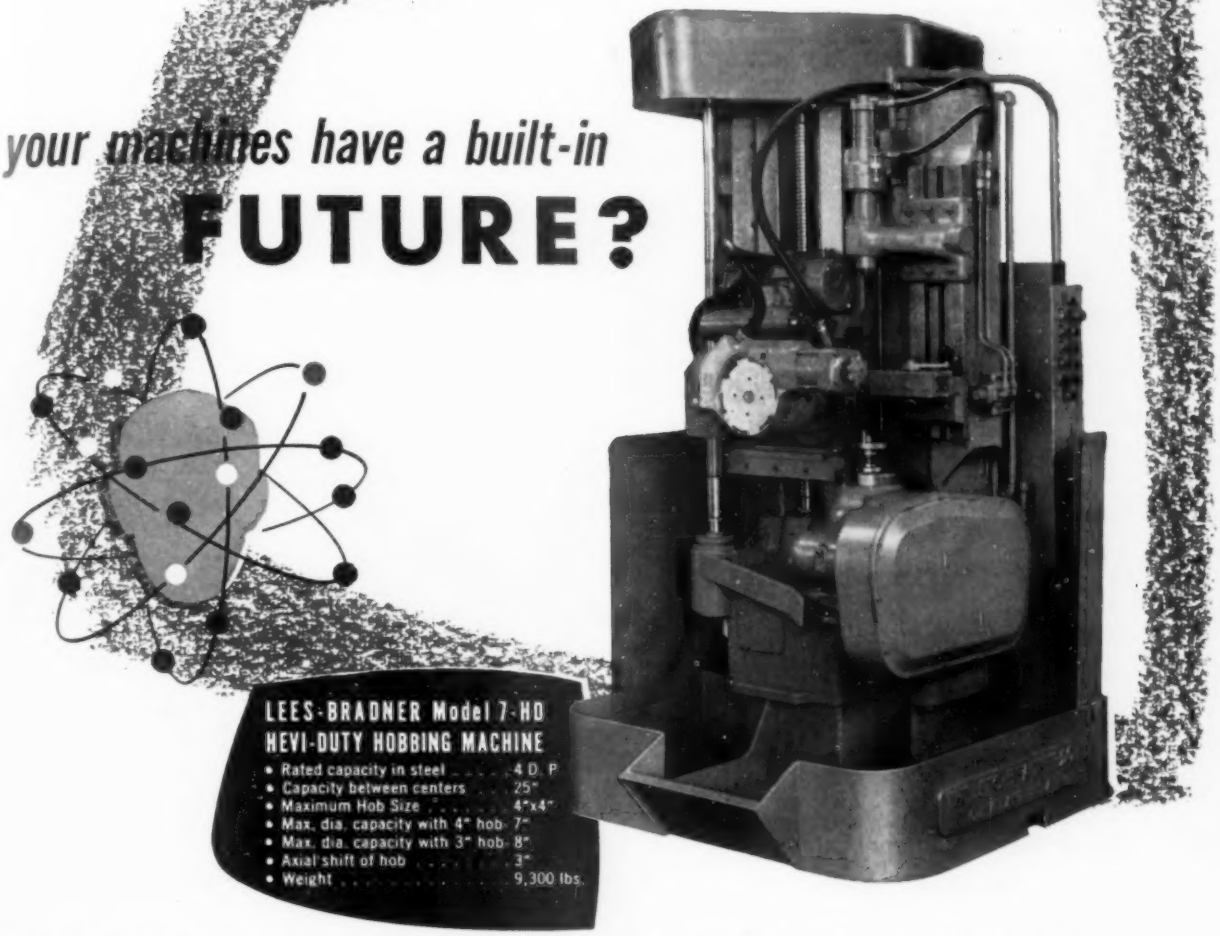
NORTON

GRINDERS and LAPPERS

Making better products... to make other products better

District Sales Offices:
Hartford • New York • Cleveland • Chicago • Detroit
In Canada: J. H. Ryder Machinery Co., Ltd., Toronto 5

Do your machines have a built-in FUTURE?



LEES-BRADNER Model 7-HD
HEVI-DUTY HOBBING MACHINE

- Rated capacity in steel . . . . . 4 D. P
- Capacity between centers . . . . . 25"
- Maximum Hob Size . . . . . 4"x4"
- Max. dia. capacity with 4" hob 7"
- Max. dia. capacity with 3" hob 8"
- Axial shift of hob . . . . . 3"
- Weight . . . . . 9,300 lbs.

Yesterday's machines were engineered for yesterday's requirements. But the pace of modern industry has changed. The machines you bought yesterday are hard-put to meet today's production demands. They may need replacement.

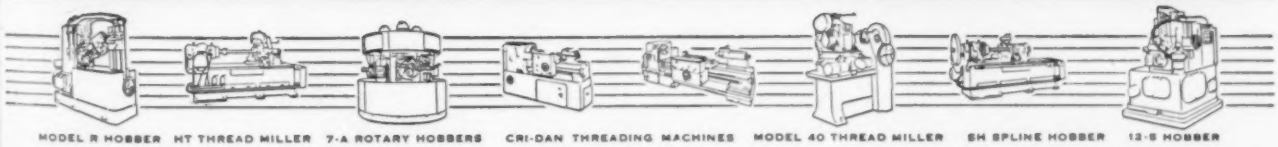
When you buy your new machine, gear your thinking to the future. Meeting today's production needs is not enough—your machine *must* have a built-in future. It must be engineered to fit tomorrow's production picture, TODAY!

The Lees-Bradner Company manufactures a complete line of hobbing machines that are designed to meet varied requirements. For example, the new 7-HD, Hevi-Duty Vertical Production Hobbing Machine is built to hob *today* at tomorrow's higher feeds and speeds. It's a heavier, more powerful machine equipped to meet industry's demands for savings in time and labor. It has a built-in future, a reserve capacity to produce for today's industry *and* tomorrow's, as well.

Your Lees-Bradner representative will be glad to give you the facts. Or, write us direct.

the LEES-BRADNER *Company*

CLEVELAND 11, OHIO, U. S. A.



MODEL R HOBBER · HT THREAD MILLER · 7-A ROTARY HOBBERS · CRI-DAN THREADING MACHINES · MODEL 40 THREAD MILLER · SH SPLINE HOBBER · 12-S HOBBER

IF YOU THREAD OR HOB . . . GET A BETTER JOB WITH A LEES-BRADNER

PARKER · MAJESTIC (pm) PRECISION MACHINES

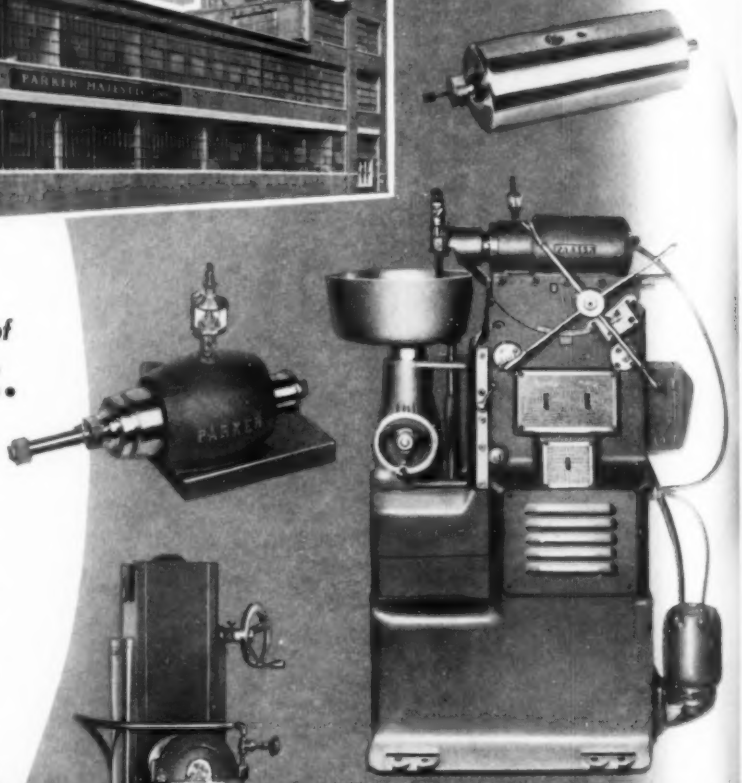
25 Years of Progress

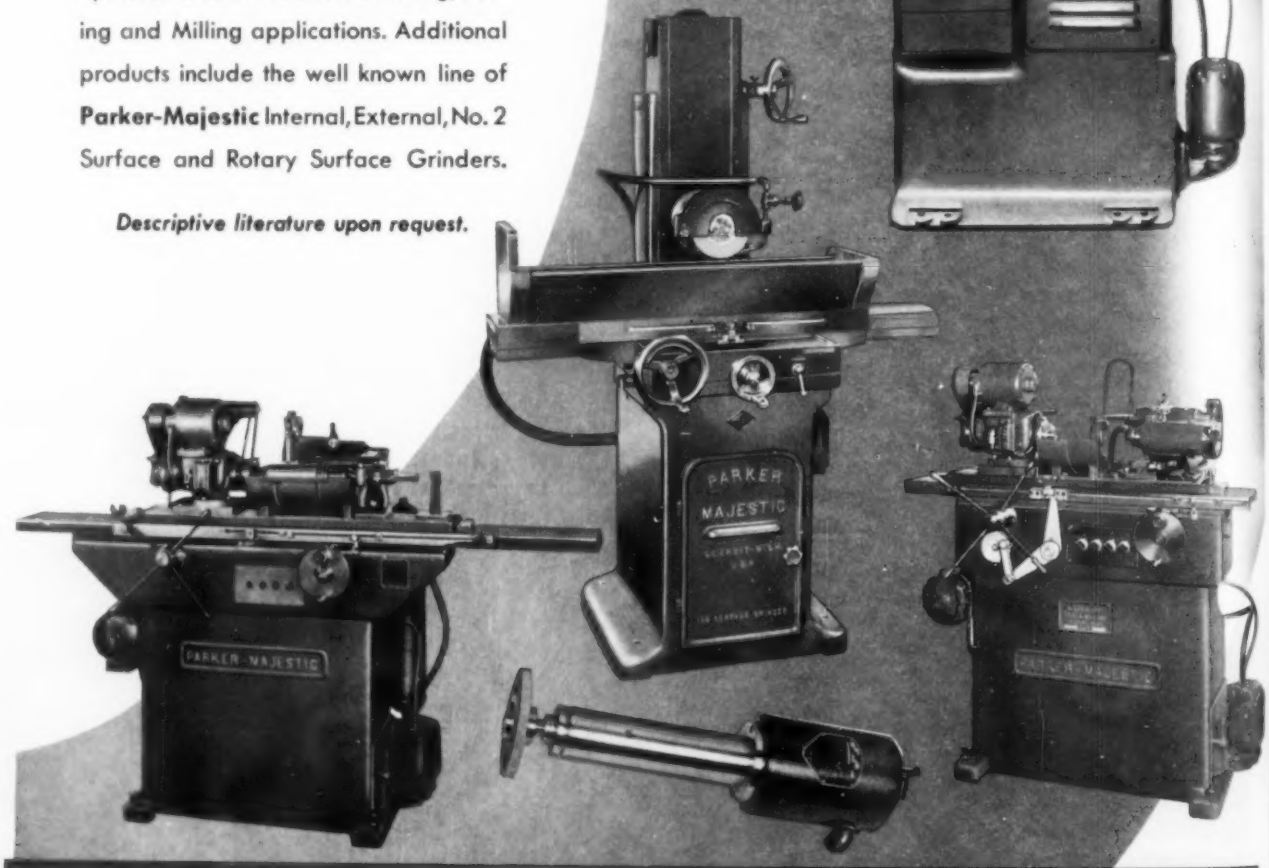
Pictured here is the home and products of

PARKER-MAJESTIC, INC.

Established in 1929, this company has for 25 years manufactured the **Parker** Spindles used in Precision Grinding, Boring and Milling applications. Additional products include the well known line of **Parker-Majestic** Internal, External, No. 2 Surface and Rotary Surface Grinders.

Descriptive literature upon request.





PARKER-MAJESTIC, INC.

147 JOS. CAMPAU • DETROIT 7, MICHIGAN

FOR FURTHER INFORMATION, USE READER SERVICE CARD; INDICATE A-11-58

Announcing

MILLING CUTTERS *and* END MILLS *by* Butterfield

With the addition of Milling Cutters and End Mills, Butterfield now offers a full line of metal cutting tools. Milling Cutters and End Mills are made to the same exacting standards of dependability and extra performance which mark Butterfield's Taps, Dies, Drills, Reamers, Counterbores, and Screw Plates.

BUTTERFIELD

UNION TWIST DRILL COMPANY
BUTTERFIELD DIVISION
DERBY LINE, VERMONT, U.S.A.

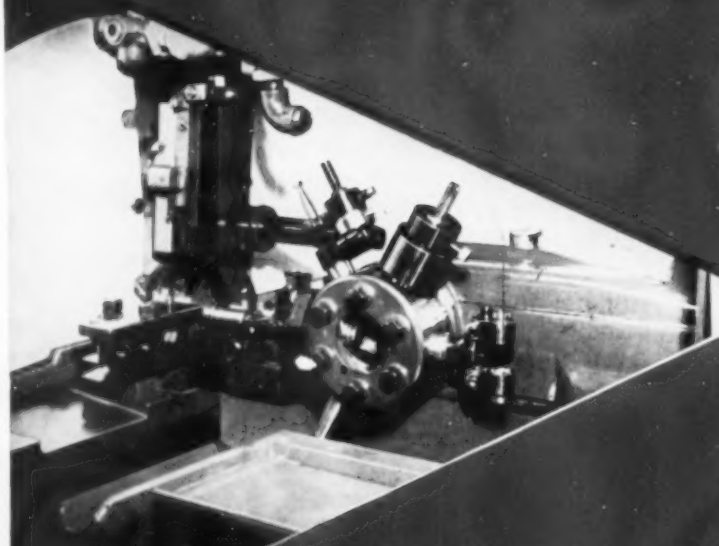
TAPS-DIES-DRILLS-REAMERS-COUNTERBORES-SCREW PLATES-MILLING CUTTERS-END MILLS

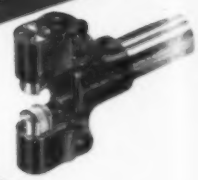
FOR BETTER SERVICE
CALL YOUR
BUTTERFIELD
DISTRIBUTOR

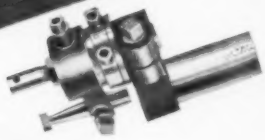
PRECISION IS AS PRECISION DOES

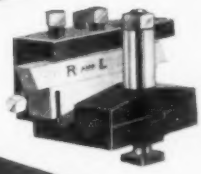
R AND L TOOLS

The Tools A Meticulous Machinist Would Design For Himself









Faultlessly ground for accuracy and alignment at any point of adjustment, here are tools of toughest, heat treated, alloy steel . . . guaranteed not to bend or give way. R AND L TOOLS were developed in a machine shop . . . the culmination of over 45 years of experience and research . . . truly masterpieces of the tool maker's art.

R AND L TOOLS pay for themselves through reduced setting up time . . . speeding up production . . . lower operating costs!

Write for Catalog

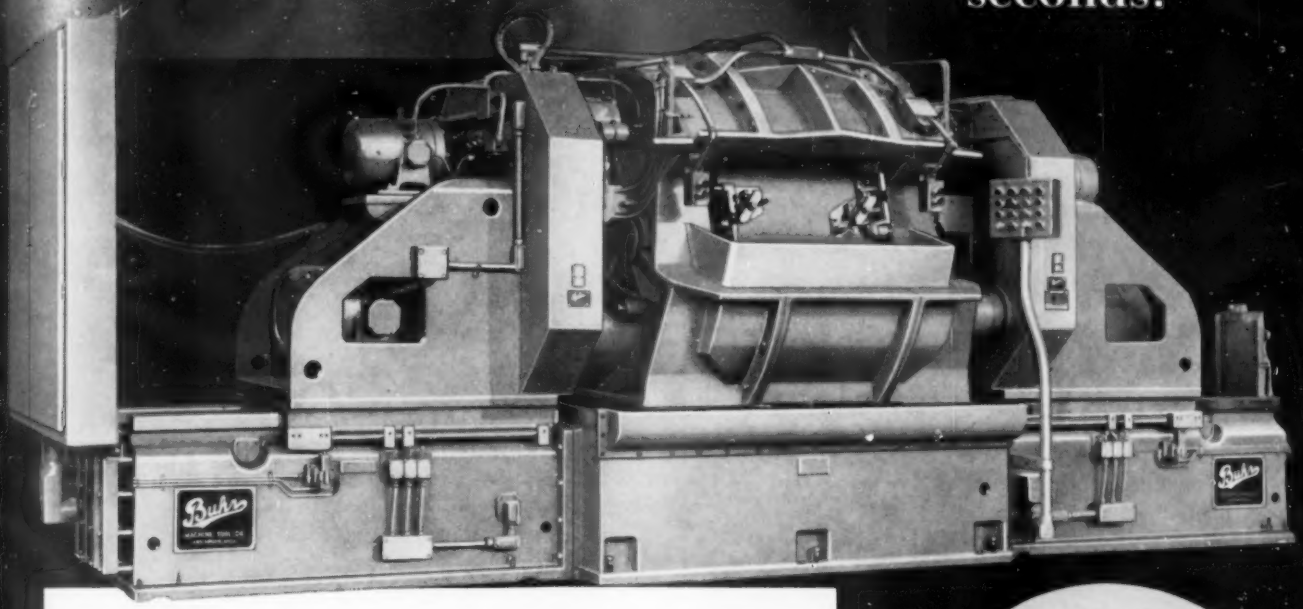
RIGHT R and L LEFT TOOLS

1825 BRISTOL STREET — PHILADELPHIA 40, PENNA.

TURNING TOOL · CARBIDE OR ROLLER BACKRESTS · RELEASING OR NON-RELEASING TAP AND DIE HOLDERS, (ALSO FURNISHED FOR ACORN DIES) · UNIVERSAL TOOL POST · TURRET BACKREST HOLDER · CUT-OFF BLADE HOLDER · RECESSING TOOL · REVOLVING STOCK STOP · FLOATING DRILL HOLDER · KNURLING TOOL

Buhr SPECIAL...

Drills, chamfers and taps two rear axle drive shafts every 22 seconds!



This Trunnion-Type Buhr Special drills, chamfers (both sides of holes) and taps 328 pieces an hour at 100% efficiency.

Two parts are loaded per fixture on this 6-station, 2-way Buhr Special.

Hydraulic clamping-and-unclamping is completely automatic.

Cluster heads — incorporated in a master gear box — are featured, as with all Buhr Trunnion-Type Machines.

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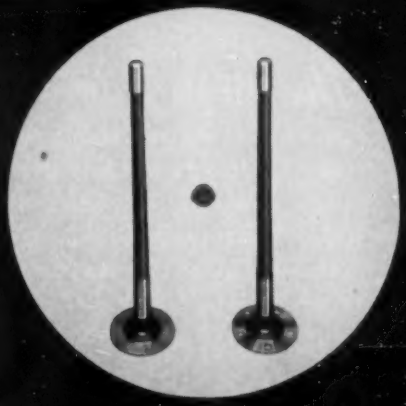

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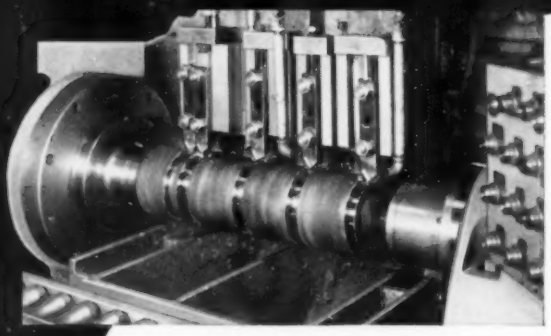
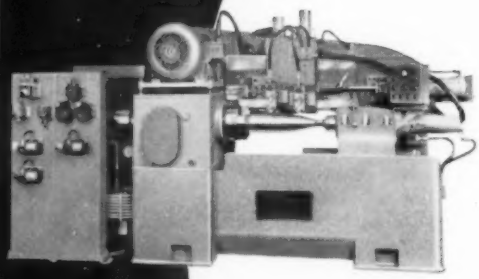


52 lbs. of metal being removed per minute on one of the HD-16 Hydra-Feed lathes.

The HD-12

Like all other models, designed to J.I.C. standards. Note absence of tools in front of machine. Swing over top carriage is 14 inches on this model. Length between centers is 36 inches.



Announcing

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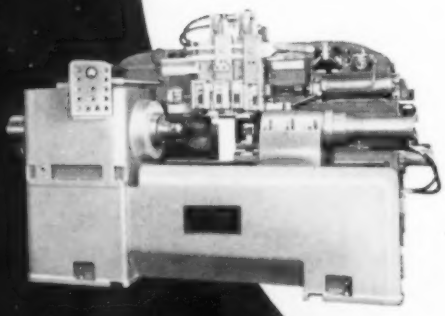
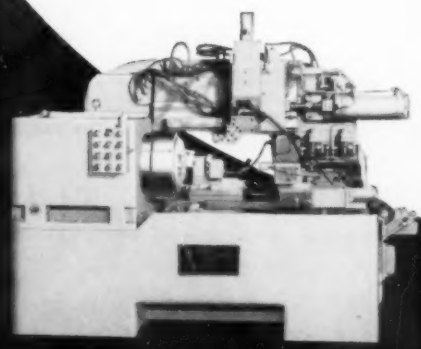
The HD-16

Chip disposal presents no problem on Hydra-Feeds. Big chutes have provision for chip conveyors. This model carries a 100 hp. motor. Length between centers is 48 inches; swing over top carriage is 17-inch diameter.



The HD-24

Chucking type model with platen slides (optional). Like all other Hydra-Feeds this machine has infinitely variable speed ranges through pick-off gears; longitudinal feeding rear and top carriages available.



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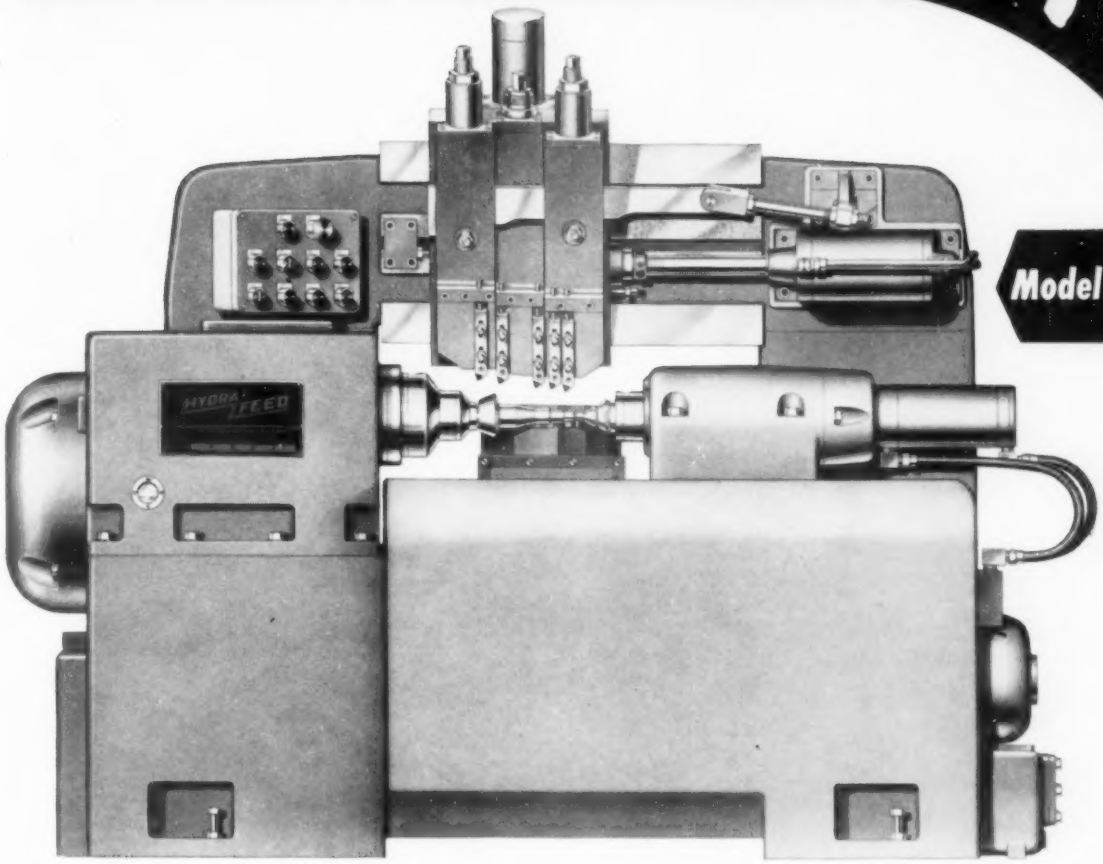

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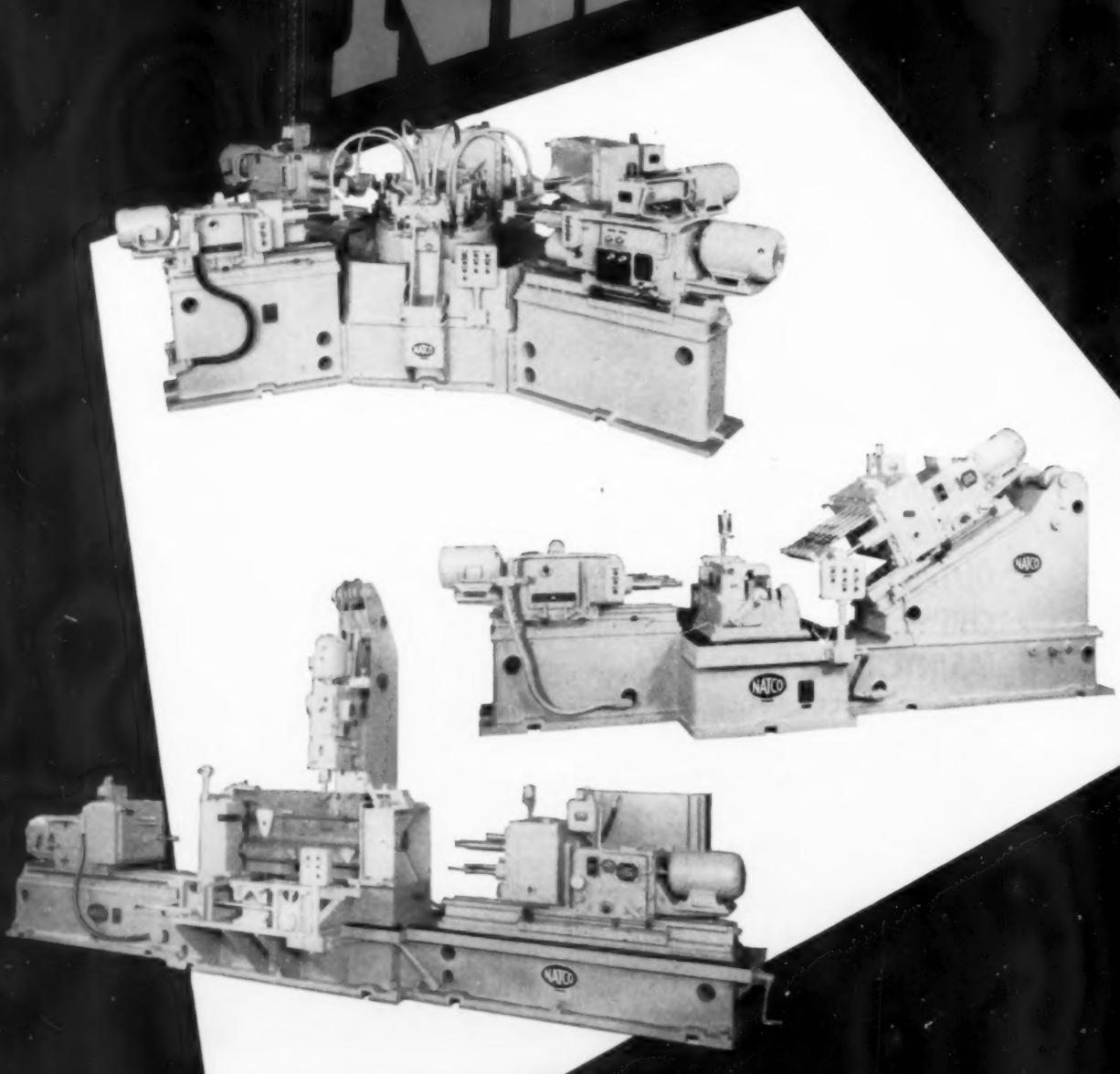
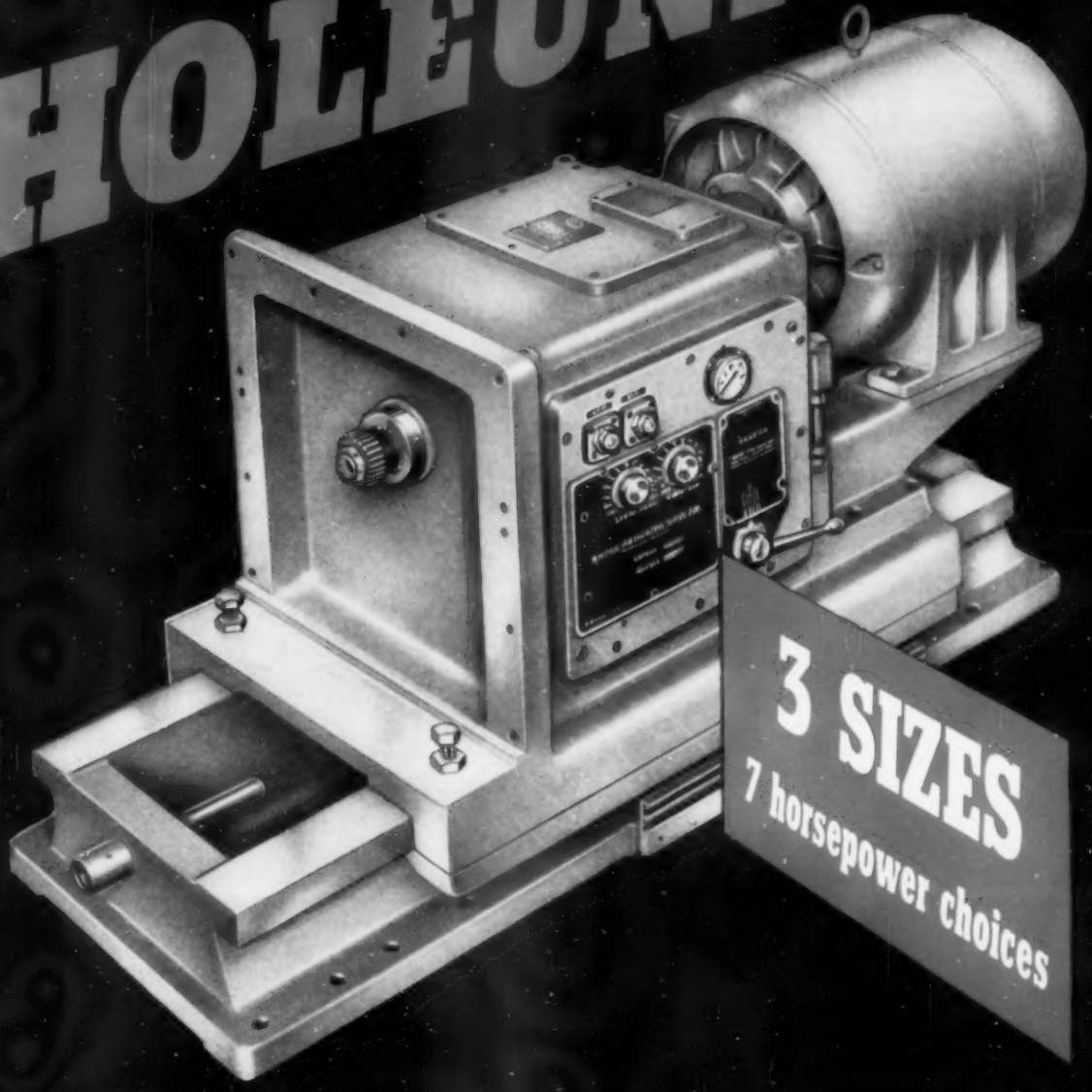


HOLEUNITS



Shown at left are a few representative machines that have been built from NATCO Holeunits. These standard, compact, self-contained hydraulic units are furnished in three sizes and may be arranged with any one of seven different horsepower capacities ranging from one and one-half to fifteen horsepower. They will operate at any angle and no connections other than electrical are required.

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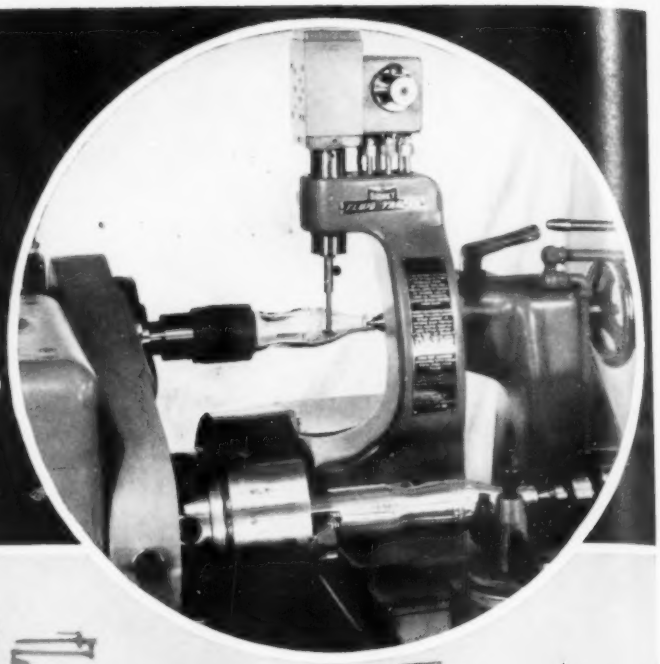

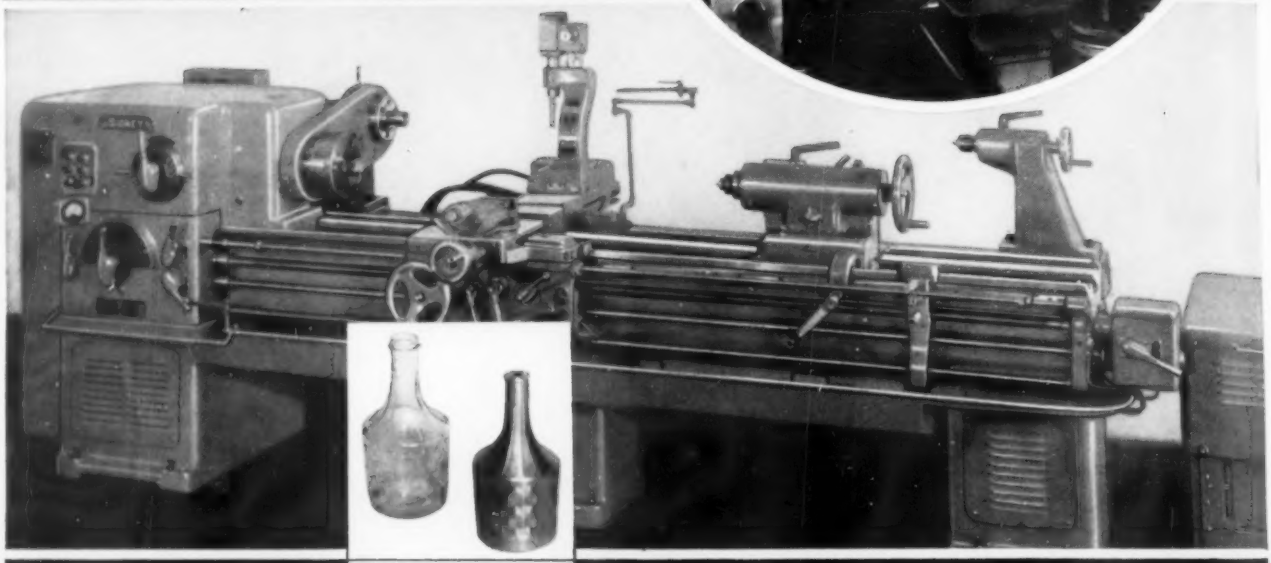

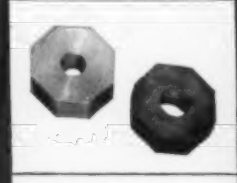

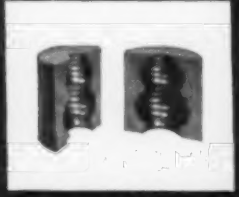

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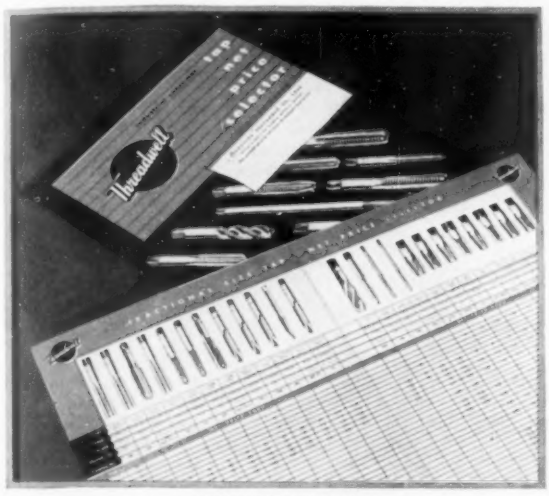

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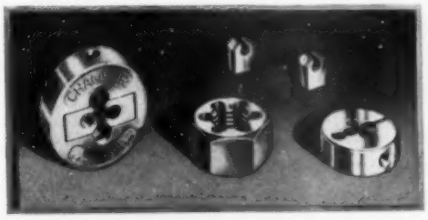

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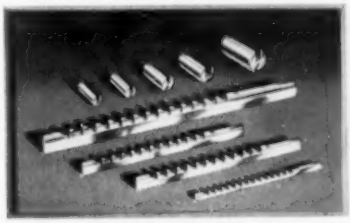

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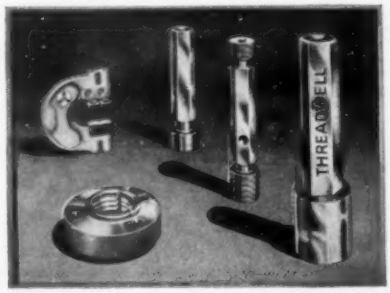

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The Tool Engineer

Growing through Serving

A few months ago I urged each of you to take advantage of our monthly technical sessions. Now, I want to mention other ways to improve your technical know-how. Membership on the various committees, either Chapter or National, is one of the most beneficial aspects of our Society.

Consider the Program Committee, for example. If you were a member of this active committee, you would become well-informed on latest methods of machining and engineering. When the committee meets to line up the year's schedule of technical talks, you would be assigned to contact leading industries to discuss the possibilities of putting on a program.

The Education Committee is another worth-while group with which to participate. Discussion and association with industrialists and educators can be most enlightening.

Serving on the Membership Committee can also be rewarding. This committee contacts all the tool engineers in the area. Today, with the acute shortage of tool engineers, it is mighty handy to know where to contact the right engineer to do a specific job.

I have mentioned only three committees, but all are equally active and rewarding. By taking an active part in committee work, you enhance your chances for advancement. It will bring you in contact with men in all branches of engineering who are experts in their fields. By these contacts you will acquire the personal poise that is so important in your work.

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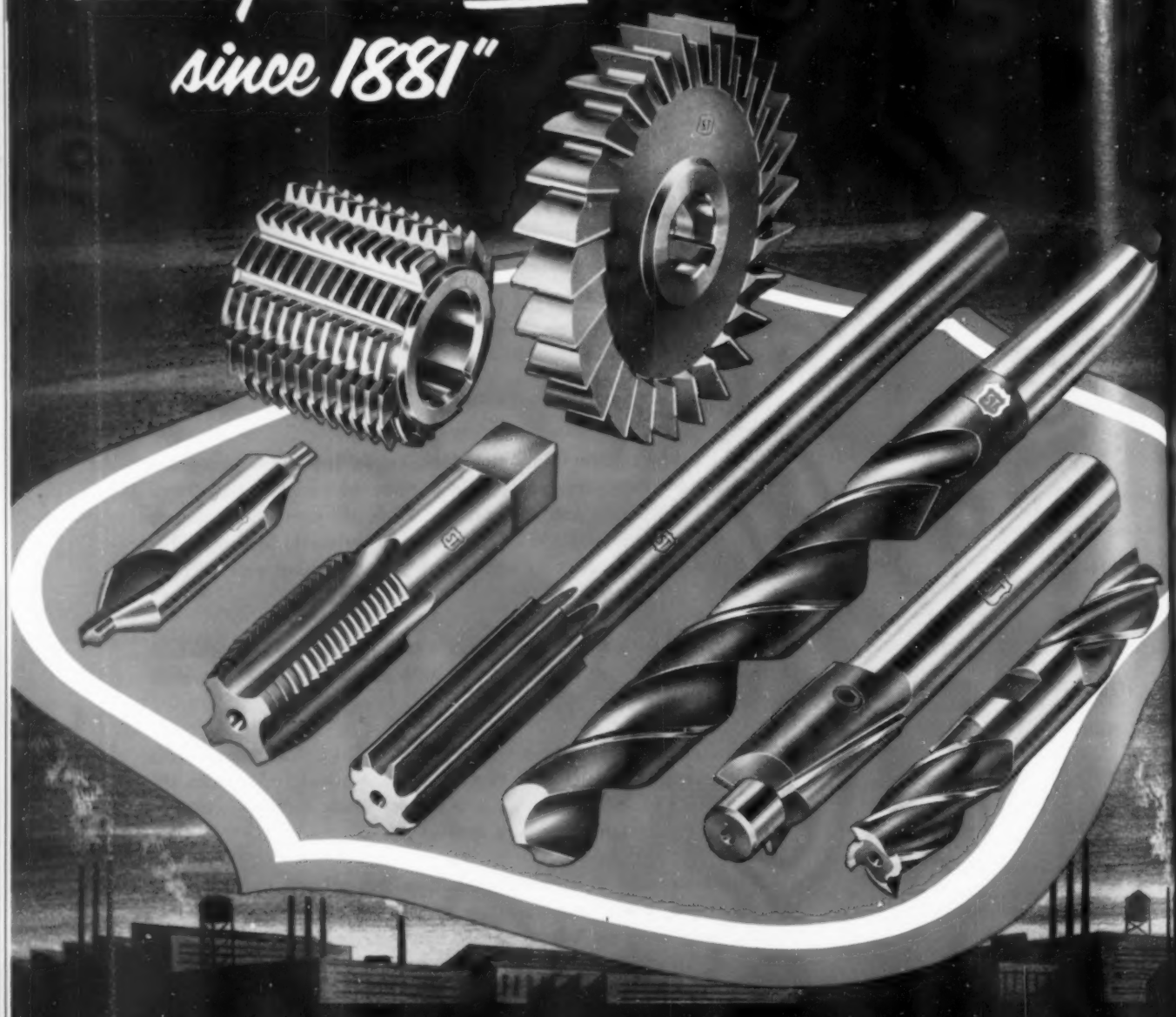

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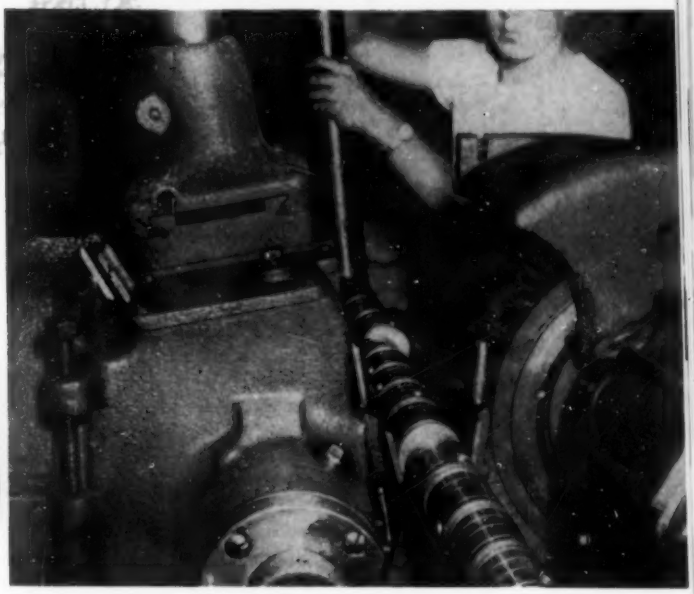
Fig. 1. Centerless brushing removes grit and surface irregularities of pistons, gives a microfinish, increasing service life of both pistons and cylinders. Production is 10,000 pieces per shift.



Power Brushing

a versatile production tool

By R. O. Peterson

Manager Technical Dept.
The Osborn Manufacturing Co.
Cleveland, Ohio

POWER BRUSHING, once considered an auxiliary finishing operation is today an efficient, cost-saving production tool. Ten years ago, relatively few operations were handled by brushing methods. Today, a metalworking plant may use brushes for a hundred or more different operations. They are effectively and economically used for many jobs including conditioning surfaces to achieve specific characteristics, *Fig.* 1, removing burrs and surface films, finishing edges, imparting a characteristic to the surface or causing the movement of material from or along a surface, TABLE 1.

Brushing tools are unsuited for removal of appreciable quantities of metal or other materials from a surface to achieve a dimensional size. They are, however, effective as tools for removing small amounts of metal to eradicate surface markings and to blend surface junctures. Frequently, the removal of only a small amount of material prevents sharp edges which are often undesirable for various reasons.

Advantages of Power Brushing

Many of these operations can also be performed by other means. What then are the advantages of power brushing?

First, is process versatility—possibility for varying degrees of mechanization ranging from strictly offhand operations to fully automatic equipment with practically every degree between these two extremes depending upon the volume and the rate of production required.

Second, brushes and brushing equipment constitute important production tools because they fit into those manufacturing operations where the ratio of labor costs to other production costs is high. The production yield of a brushing operation is influenced by the design of the brushing machine employed to operate the brush. For example, completely automated equipment which feeds the parts automatically and moves the parts through one or more brushing stations is capable of brush finishing at the rate of 1000 to 2000 parts per hour, *Fig.* 2. On the other hand, a simple work fixture such as

Table 1—Applications Suitable for Power Brushing

- Removing burrs, loosely adhering filaments and fuzz
- Blending of surface junctures to form smooth joining curves
- Finishing by blending sharp surface markings into smooth curve junctures to avoid stress concentration
- Finishing for appearance
- Finishing to achieve a specific surface characteristic such as minimum friction and tendency to seize
- Fixing and buffing
- Removing scale and small slivers
- Wet scrubbing
- Dry brushing to remove or collect particles carried on or adhering to a surface
- Cleaning to remove stains, rust, etc.
- Stripping insulation from portions of wire to prepare for the making of electrical contact
- Conveying materials
- Stretching and controlling sheet materials such as fabrics
- Spreading oil, paint, wax, adhesives, fluxes and other coatings
- Roughening surfaces preparatory to joining as by adhesives
- Preparing for plating, painting, soldering, etc.

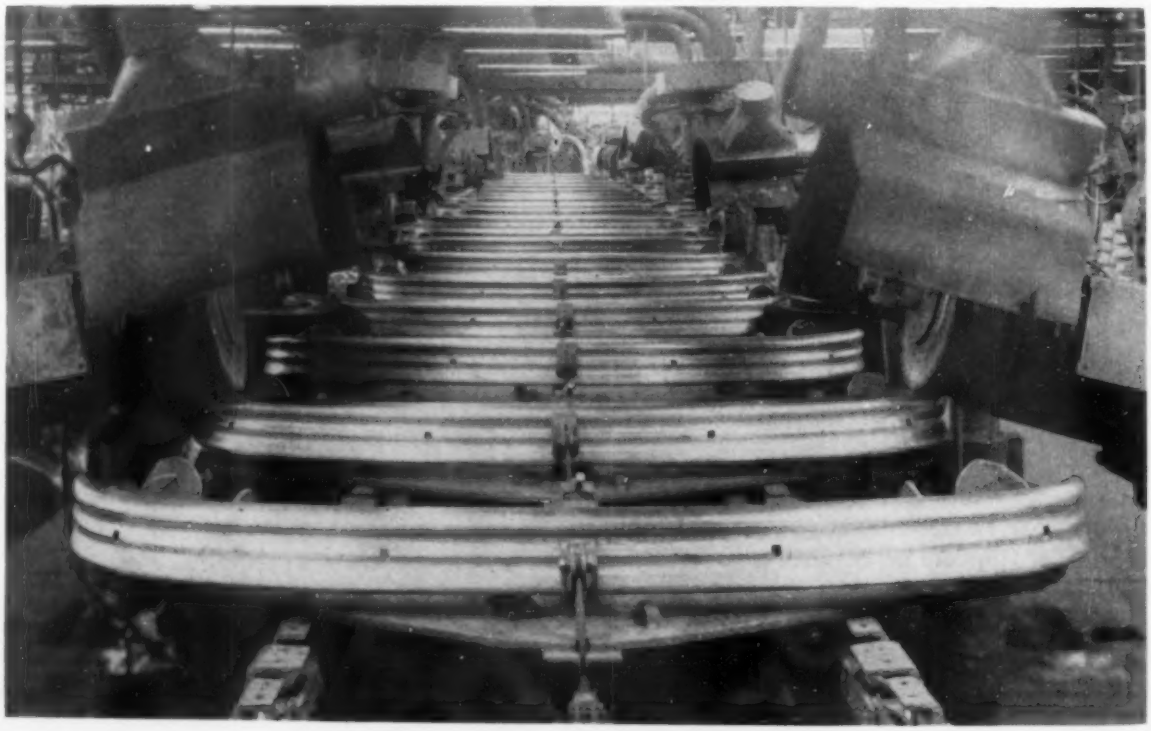
a hand-held tool for holding the part in front of a rotating brush would be applicable where a much lower production yield per hour is required.

With well-designed machines capable of feeding and guiding the workpieces, rate of production finishing by brushes is comparable to other related manufacturing operations. With thorough consideration of the proper application, power brushing methods can constitute a means of reducing labor costs by minimizing skilled labor requirements.

Brush Flexibility: The flexibility of brushes as compared with setup wheels or abrasive belts is a characteristic which enables them to conform to the many slight irregularities and contours of a part. Brushes act uniformly over the surface, penetrating slight recesses. In contrast, grinding wheels work on the high spots alone. By penetrating surface irregularities, the brush is able to blend edges and surfaces. In addition to promoting a pleasing appearance, this blending reduces stress concentration areas from which fractures can propagate and promote corrosion, *Fig.* 3.

Brushing Prevents Progressive Fracture: The subject of repeated or reversed stress is becoming more and more important because of the higher speeds which have become common in aircraft, automobiles, machine tools and other mechanical equipment. Brushing is finding increasing application in preventing fatigue failure. High localization of stress may be caused by a sharp irregularity, such as a sharp edge or mark where a minute fracture starts and then enlarges. Sometimes many small microscopic cracks are propagated in the process of producing a part. When the

Fig. 2. Preplating surface finishing with power brushing reduces surface imperfections and improves quality of plating job.



ress load is repeated often and severely enough, e whole member ruptures. It has been estimated hat the cause of as high as 80 percent of machine art failures is stress concentration and progressive racture.

Power brushes help solve many problems of exessive local stress concentration and progressive racture, by providing fast, economical and effective production methods for producing smooth curves n place of sharp tool and grit marks, and surface unctures. Bolts and studs are particularly vulnerable to rupture under heavy tensile loads. Removal of sharp edges and attendant burrs, without changing the shape of the threads and without removing a measurable amount of metal, reduces the stress concentration area and assists in overcoming this problem. Other methods of removing burrs frequently substitute two sharp stress-concentrating edges for each one removed. With correct brushing technique, a smooth-curve blending of the sharp edge juncture is produced in place of the burrs. *Fig.* 4.

Another example of effective power brushing is in removal of excess rubber from a pin associated with tank track treads. *Fig.* 5. Previously, use of cutting tools for production of the parts caused breakage of the pins in service. Further, the cutting tools, regardless of speeds and feeds used, produced tool marks and fragmented the surface metal sufficiently to cause small microscopic cracks. It was found that by brushing the pins, the exposed track surfaces resisted the formation or spreading of small microscopic cracks which would eventually have caused rupture.

The importance of manufacturing methods that enable parts to be produced without such flaws or faults can hardly be overemphasized. Investigators have presented data to show that a sharp edge or row of burrs may reduce endurance limits of a part as much as 50 percent, and a distinct V-notch may reduce the endurance limit by as much as 60 percent.

Breaking Sharp Corners: Where a brush can act on an edge it is highly efficient in removing enough metal to produce a uniformly rounded edge. Surface finish requirements can readily be met on the surface adjacent to the edge. Dimensional tolerances and shape of the part have great influence on the type of brushing tool to be used. A fixed-grit wheel, cutter or file is likely to remove sufficient metal to change the dimensional tolerance of a part, while a flexible brushing tool tends to follow the shape and contour of a surface without removing an appreciable amount of metal anywhere except at edges. *Fig.* 6. Understanding of factors affecting selection and application of power brushes is necessary for proper and efficient production brushing operations.

Choice of the Correct Brush

Selecting a brushing wheel for a given application is done best after compiling the following information:

1. What is to be accomplished?
   a. Clean or remove—what material?
   b. Rough or smooth—what kind of surface?
   c. Surface blending—to what degree?
   d. Round corners or blended surfaces—how much?
   e. Job to be done, under what circumstances, and to what degree?
2. What equipment is available or justifiable?
   a. Brushing lathe—what horsepower and speed?
   b. Standard automatic and semiautomatic brushing machine—what type?

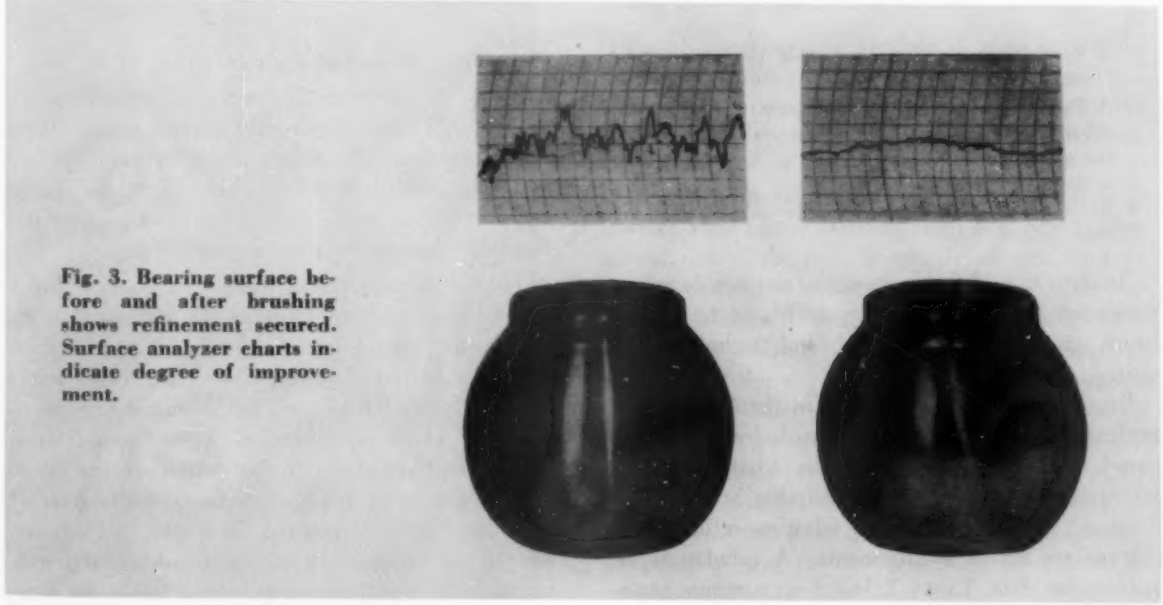


Fig. 3. Bearing surface before and after brushing shows refinement secured. Surface analyzer charts indicate degree of improvement.

Table 2—Brush Selection and Application Data

For Jobs Requiring Surface Finish Less than 30 microinches, rms			For Jobs Which Permit or Require Surface Finish above 30 microinches, rms*		
Brush Flexibility			Brush Flexibility		
Medium		High	Low		High
Brush Finishing Ability			Brush Finishing Ability		
Fine (Low rms)		Medium	Fine		Coarse
Brushing Action			Brushing Action		
Medium		Fast	Medium		Fast
Cord & Fabric Brushes	Tampico & Treated Fiber Brushes	Fine Wire Sections (Burring Compound)	Wire Wheels	Wire Sections	Coiled Knot Sections
Brush Characteristics					
Fast-cutting medium flexible wheels. Used with cut and color buffing compound for producing fine finishes	Flexible, cast cutting wheels. Used with burring compounds of tacky composition for producing surface finishes of approx 8 to 10 microinches, rms	For efficient use of wire brushes with compound, select brushes having medium or high density and fine wire size (0.008") diam or finer)	Wide face, dense fill. Used where fast cutting and fine finishes are required. Best general purpose wire brush	Narrow face, medium density. Used where medium brush flexibility is essential to follow contoured surfaces	Narrow face, low density. Used where brush flexibility is needed and where surface impact action is necessary, especially to remove encrustations
Production Applications in Order of General Usage					
1. Cut and color buffing 2. Surface blending 3. Light scale removal 4. Producing smooth curve junctures 5. Burr removal	1. Light burr removal 2. Producing smooth curve junctures 3. Light scale removal 4. Surface blending 5. Cleaning 6. Satin finishing	1. Medium burr removal 2. Light scale removal 3. Satin finishing 4. Producing smooth curve junctures	1. Heavy burr removal 2. Producing smooth curve junctures 3. Rust and oxide removal 4. Scale removal 5. Cleaning 6. Surface blending	1. Cleaning 2. Medium scale removal 3. Rust and oxide removal 4. Satin finishing 5. Surface blending 6. Burr removal	1. Heavy scale removal 2. Rust and oxide removal 3. Satin finishing 4. Burr removal (on hard metals)
Adjustments for Production Troubles (all brushes)					
Brush works too slowly	Brush works too fast	Burr peened to adjacent surface	Finer or smoother finish required	Finish too smooth and lustrous	Brushing action not uniform
1. Increase surface speed by increasing OD or rpm 2. Decrease trim length 3. Increase fill density 4. Increase filament diam	1. Reduce surface speed by reducing rpm or OD 2. Reduce filament diam 3. Reduce fill density 4. Increase trim length	1. Decrease trim length and increase fill density 2. If wire brush tests indicate metal too ductile (burr is peened rather than removed), change to non-metallic brush such as a treated Tampico used with burring compound	1. Decrease trim length and increase fill density 2. Decrease wire diam 3. Increase surface speed 4. Try treated Tampico or cord brushes with suitable compounds at recommended speeds 5. Use auxiliary buffing compound with brush	1. Increase trim length 2. Reduce brush fill density 3. Reduce surface speed 4. Increase filament diam	1. Increase trim length and decrease fill density 2. Devise hand-held or mechanical fixture or machine which will avoid irregular off-hand manipulation

*For ductile metals see Adjustments, third column

c. Special brushing machine—what productivity and cost?

d. Portable or flexible-shaft equipment?

3. What are the properties of the material from which the article to be brushed is made? Especially, what is the hardness of the material?

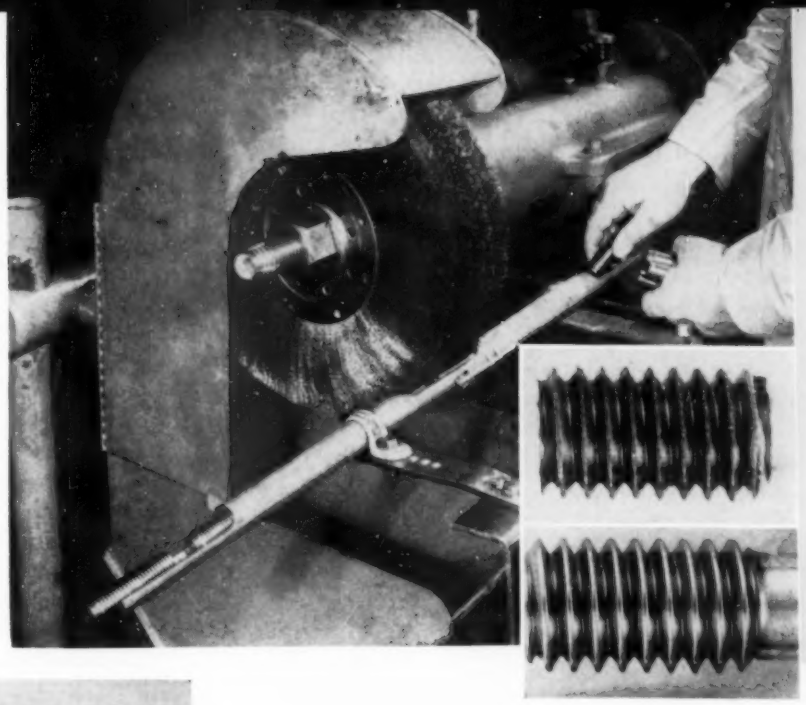
4. At what rate and under what conditions must the work be done?

Answers to such basic questions can enable an experienced tool engineer to quickly determine the brush construction, material and technique required.

Brush selection is best done in the light of experience. A single trial of a brush by an experienced operator usually tells him what corrective action is necessary to achieve suitable brush specification. The original brush selection is based on the surface finish requirements. A tabulation of application data, TABLE 2, based on common experience, can be used as a guide.

There are three major brush characteristics involved in further selecting the correct brush. These factors are brush flexibility, brush finish ability and brushing action. Following the directions in the table, it is possible to select a brush of high or low flexibility having the proper speed of action.

Thus, it is possible to tentatively select a brush and to determine from results, by reference to the table, what further changes in brush specification may be required. For instance, if the brush works too slowly, the chart may be consulted for an alternative brush specification which would overcome this limitation. If the action of the brush peens burrs to an adjacent surface, of if a finer or smoother finish is required, or if the finish is too smooth or lustrous, or if the brushing action is not uniform, the table supplies the information re-



g. 4. (right) Simple brush- operation removes sharp iges and improves surface nish of threads without hanging their shape or re- oving appreciable amount f metal. (Inset) Close-up of hread before and after rushing.

Fig. 5. (below) Molded track pins are cleaned of flash and film by wire brush assembly which contacts six critical sections. Finished pin at bottom shows results achieved.

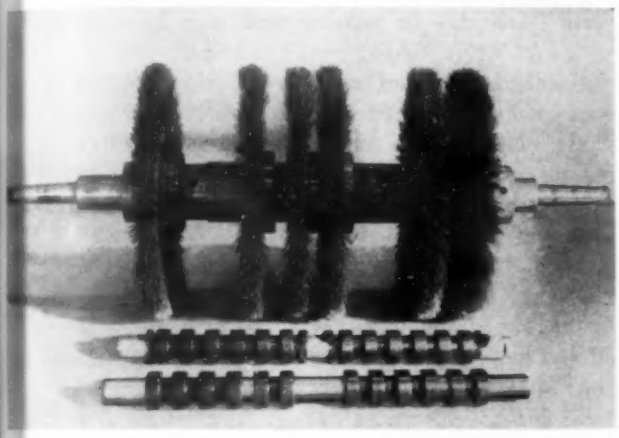
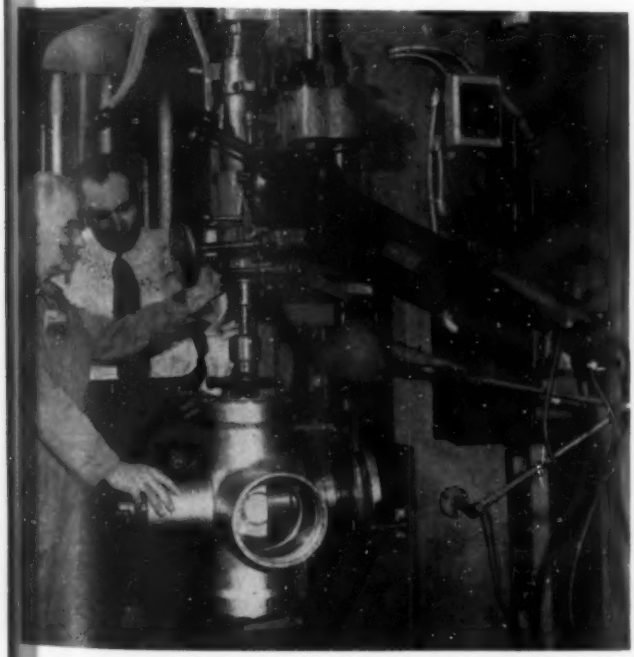


Fig. 6. Power brush mounted on converted drill press at Curtiss-Wright Corp. is saving nearly $20,000 annually. The brush, rotating at 900 rpm, is fed into the hub to clean and smooth threads and shot-peened bearing area.



quired to overcome the difficulty.

Commonly one brush is used for several different kinds of work. This may be practical where job lots are manufactured. Where parts are mass produced, however, unnecessary manipulation of the work or brush may be involved. For minimum operational costs, the most suitable brush for each job must be selected. The essential brush specifications to be considered are:

1. Type of fill material (wire, fiber, nylon, etc.)
2. Size of fill material (diameter)
3. Trim length (length of fill material extending beyond face plates or brush back)
4. Density (packing of fill material)
5. Quality of fill material
6. Outside diameter of brush
7. Surface speed of brush
8. Other treatment or special quality of fill material such as the crimp in wire or nylon.

Power brushing can produce a wide variety of finishes depending on the brush specifications and how the brush is applied. *Fig.* 7 shows some of the roll and wheel type brushes for various applications.

Brush Construction: Brush construction is another vital factor. One of the primary considerations, cost of the unit, is greatly affected by type of construction. Also, certain of the previously outlined conditions for application of brushes may be lacking, creating secondary problems such as streaking of the work, short brush life and unsafe operation. While there are certain fundamental rules that can be applied in selecting the appropriate type of brush construction for a specific application, the manufacturer of the brush should be consulted in the final determination of which construction is best for the operating conditions involved.

In general, there are three principle constructions. The most common is the sectional type, which is usually made in sections one-half inch thick. Several units can be ganged together to make a brush of the required width. This type finds wide usage for brushes having faces of six inches or less.

The second most widely used brush contruction is the brushing roll comprised of continuous helically wound brush strip having either a closed or an open face, depending upon the pitch. The pitch may be as low as $\frac{3}{8}$ inch and as high as two or three feet.

The third group is a miscellaneous group made of various configurations which are modifications of the two main groups. In this group are end and cup brushes, Sibot brushes, etc.

Construction of a brush is important because on it depends the brush's ability to hold the fibers, bristles or wires and withstand the forces created by centrifugal action and friction of the work.

In certain brushing operations the centrifugal force is the major force involved. On others the load created by the friction or drag of the fibers, bristles or wire against the work constitutes virtually all of the load. In some cases, it is a combination. With heavy loading it is important that the material be held tightly so it will not pull out, break off or slip around so as to cause a condition of increasing out-of-balance.

In addition, the wheels and rolls must be made so that they can be adapted to various shafts and arbors under conditions of wetness, heat and intermittent loads.

Applications of Power Brushing

Cord brushes have shown outstanding results in work as they can commercially produce surfaces having roughness of 8 microinches, rms, or less, while removing burrs from all types of metal parts including hardened, high-alloy steels.

The treated fiber brush finds its place in surface blending prior to plating. Here the capacity for fast cutting inherent in this type of brush enables the surface to be uniformly brushed, thereby blending imperfections so that a uniformly satisfactory plating job may be accomplished at a minimum cost, *Fig.* 2.

Hard cord brushes used in finishing stainless steel have much less tendency to develop drag lines in the finish than do other methods. It is the fast cutting action and firm cushion of the brush which avoids producing these drag lines. The fast cutting action of these cord brushes used with suitable compound permits the production of a satisfactory finish with fewer wheels or passes.

Fiber, cord and fabric brushes can modify and change the condition of metallic surfaces appreciably. It is this ability which gives these brushes value for polishing and buffing. The action of a brush is that of blending imperfections and surface irregularities rather than the actual removal of metal as is obtained with abrasive wheels or belts. It has also been demonstrated that the blending

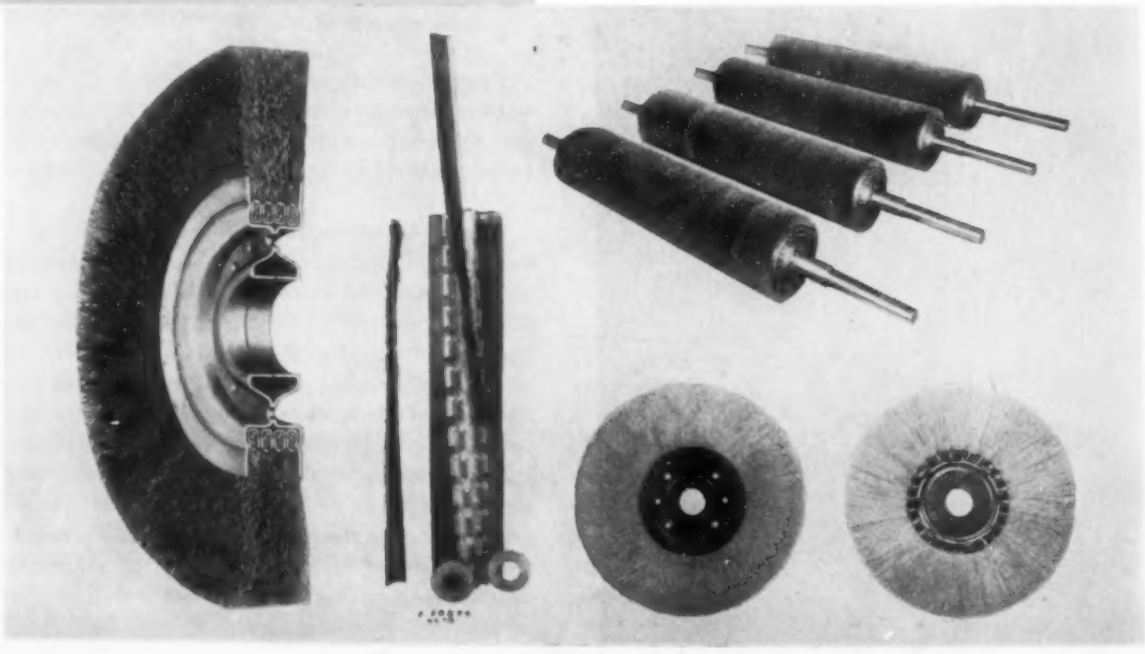


Fig. 7. Variety of power brushes commonly used in production applications. Typical wide-face wire brush, shown cut away, has high fill density. Strip brush roll features variable density. The brushing face is made to conform to various shapes from concave to convex. Brush roll for speeds up to and in excess of 10,000 fpm is for heavy-duty operations. Treated Tampico brush holds abrasive well, is used in wheel of three or more sections.

tion of a brush reduces surface imperfections to state where a uniformly good plating job can be tained. This can be done without the need for ting an entire surface down to the depth of the pest surface imperfections and therefore fewer heels or passes are required.

The photomicrographs, *Fig.* 8, characterize the duction in surface imperfections which are obtainable through brushing. Comparison of the two surfaces shown emphasizes the improvements in surface appearance produced by brushing.

Surface Preparation for Plating: Sharp edges or groove-like marks which are produced by fixed grit wheels or belts tend to build up relatively high current densities at these sharp points and as a result the plating tends to emphasize the surface irregularities. In the case of the sample which has been brushed with a treated Tampico wheel, the surface has been uniformly blended and all sharpness has been removed. The surface is such that uniform plating should result. Analyzer charts show a surface roughness of 24 to 35 microinches, rms, for the original sample, whereas the same surface brushed with a treated Tampico brush gives a reading of from 4½ to 7 microinches, rms.

Evaluation of a surface brushed preparatory to plating should be made in the light of plating results. When comparing a brushed surface with a surface obtained by older methods of polishing and buffing, it will be found that brushes tend to produce a somewhat duller surface finish in which defects are not hidden. Brushes produce an effect on the entire surface, actually refining it. The result is that the brushed surface plates better. Also, inspection of a brushed surface is less deceptive. After brushing has produced a satisfactory finish, fabric brushes or cloth buffs frequently are used to produce a higher color.

In *Fig.* 9 is shown a group of stainless steel parts efficiently mass-finished in one pass using three brushing heads. Particular attention is called to the sharpness of the letters which is the result of fast cutting action and firmness of the brush.

The cushion or flexibility of a brush permits certain latitude in machine accuracy. When a centerless grinder becomes unsuited to use as a grinder, it is usually accurate enough for centerless brushing. While grinding must be done within fractions of a thousandth, a brush has sufficient cushion to take up several thousandths of inaccuracy without producing a measurable difference in the surface of the part involved, *Fig.* 1. This important feature permits tolerances to be less critical, in that brushing pressure can be varied somewhat without undesirable results.

Comparative Cost of Brushes

Brushes, because they are perishable and are made from relatively inexpensive materials, can, on certain applications, be used for as little as 0.001 cent per part with advantages inherent to a brushed surface. Where brush costs appear excessive, such factors as brush construction, size and kind of brush fill material and location of the part with respect to the brush should be checked as possible means of reducing costs.

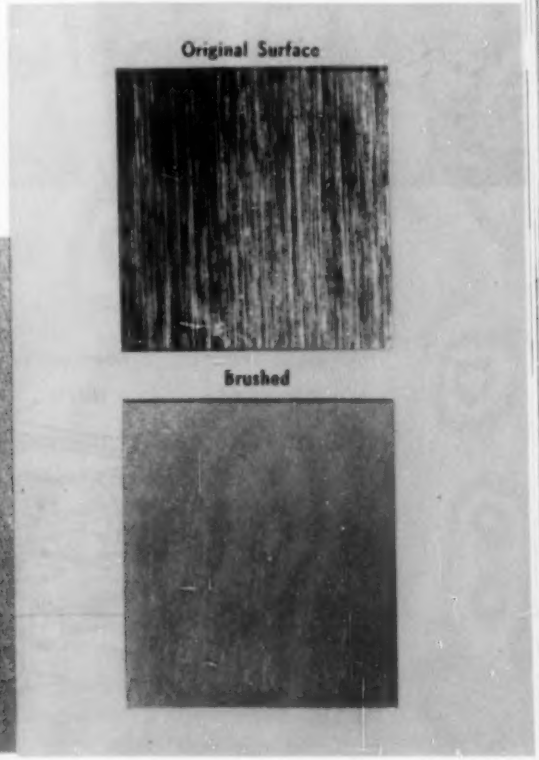
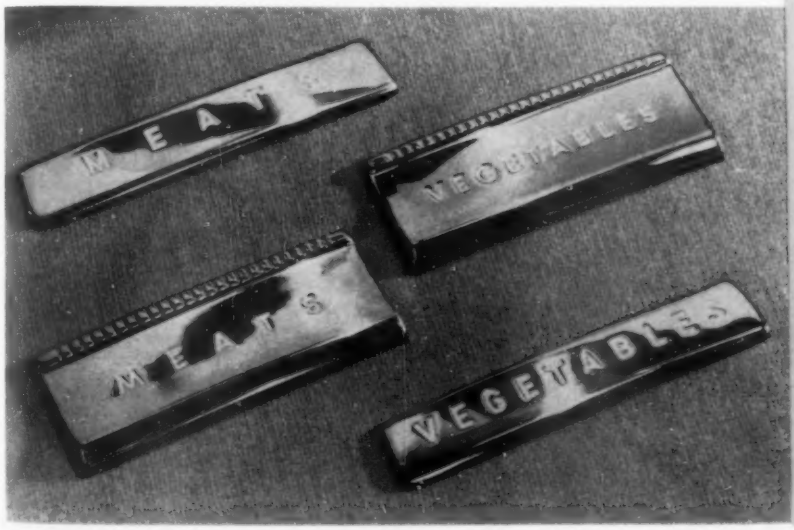


Fig. 8. (right) Photomicrographs compare surfaces before and after power brushing for finishing.

Fig. 9. (below) Stainless steel parts mass-finished with brushes in one pass using three brushing heads.

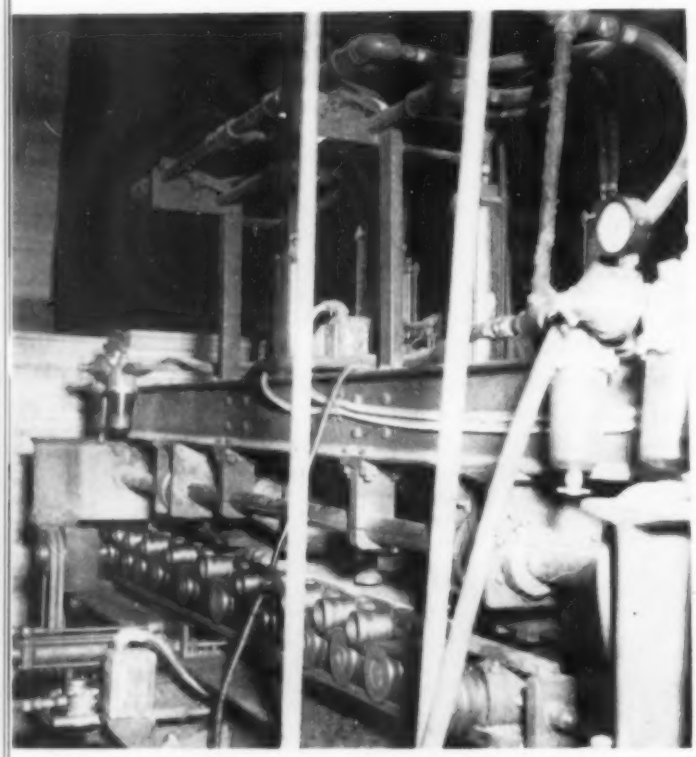


Gadgets

Ingenious Devices And Ideas To Help The Tool Engineer In His Daily Work

Special Drilling Machine

In the manufacture of automotive station-wagon parts, it was necessary to drill the edges of plywood panels to receive screws. Originally, this was done on final assembly by air drills, one hole at a time. As each panel required from ten to fifteen holes, it soon became apparent that this method was too costly.



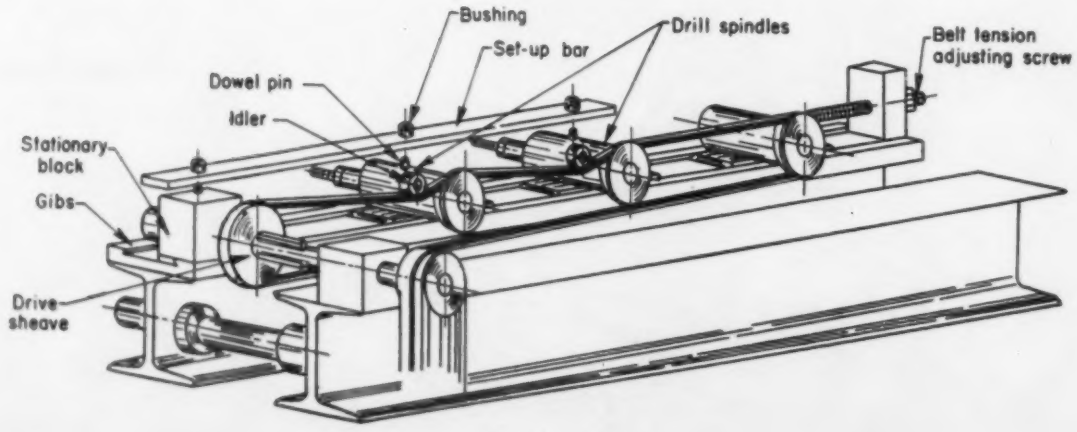
To reduce costs, a special machine was designed and built to predrill the edges of the panels before they reached final assembly. The panels to be drilled not only varied in size, but the distance between the holes also varied in different setups. Also, production requirements necessitated frequent changes in setup.

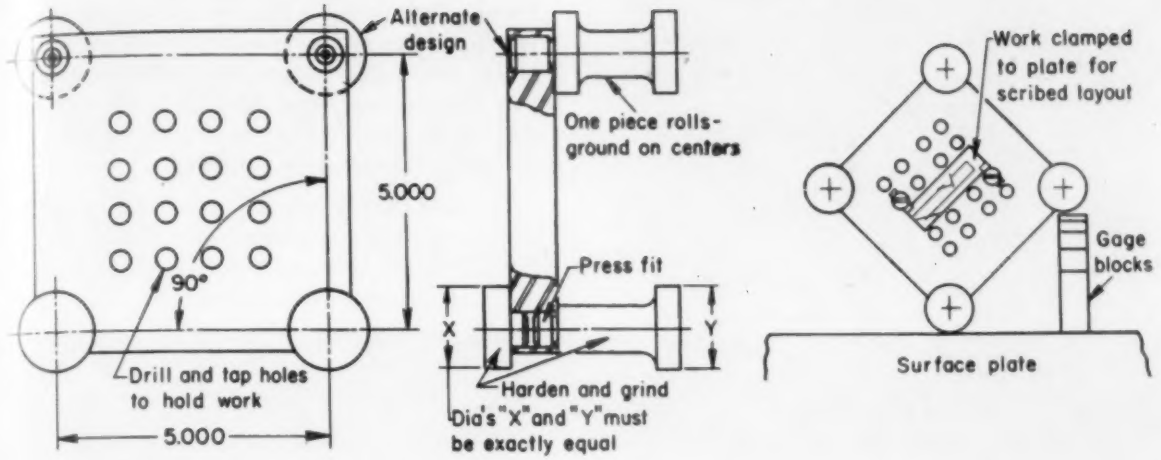
The sketch illustrates construction of the drill spindle assembly. There are three such assemblies on the machine, allowing it to drill three sides of the panel in one operation.

The drill spindles are mounted on blocks which can slide along gibs. The spindles are held in place by a setup bar having locator bushings which slide over dowel pins in the spindles. The setup bar is held stationary by the dowel pin in the stationary block.

A single belt is used to drive the entire battery of nine drills, being made to wrap partially around and drive each sheave by idler sheaves which are attached to each spindle. The setup of this machine can be changed without removing the belt and without removing or replacing a single bolt or screw. This saves money. The machine has been running about 18 hours each day for more than a year and has proved satisfactory. Belt wear is not excessive.

Charles Hayward
Saginaw Valley Chapter





Angular Layout Plate

This angular layout plate is an improvement over the standard toolmakers' sine bar or two-button sine layout plate. By providing four buttons and the protruding support legs the plate may be used for angular, parallel or squared layout lines, as shown in the accompanying sketch. With the work clamped in one position it is possible to complete an entire layout, no matter how complex, from one position of the work on the plate.

The protruding legs, with bases of the same diameter as the buttons, are precisely centered with the buttons. They act as supports, eliminating the necessity for the right-angle knee which is often used to support a sine bar or piece of work. Another advantage of this device is that it will be unnecessary to make setups for angles which would approach 90 degrees. Angles this large are difficult to work with and there is greater danger of inaccuracy as the angle approaches 90 degrees. It is a simple matter to select the complementary angle to, say 85 degrees, and set this angle (5 deg) from the adjacent side of the sine plate.

The plate may be designed for a button center distance of either 5 or 10 inches. Of course, all buttons and bases of support legs must be exactly the same and the center lines must be perfectly square with each other. Buttons and support legs should be hardened and ground. The plate may be drilled and tapped with a series of holes to assist in securing workpieces.

In the detail sketch an alternate design is shown that may be an easier form of construction. The protruding legs and buttons are made in one piece, which means that they may then be ground on a common center. This design also allows more space on the face of the plate for securing and clamping.

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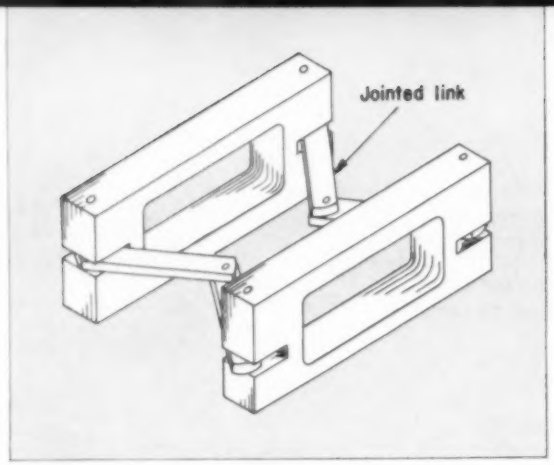
High Parallels

Conventional setups with high parallels were unsatisfactory for a job shop doing a wide variety of work, because they were needed only occasionally in the drill press to clear a projection. The most common use was to clear the shank when drilling into a punch holder. In addition to delays, there is an attendant danger in use of conventional parallels as they fall over easily or may be knocked off the table when the work is being placed in position.

To overcome this difficulty a set of parallels was made up, connected by links as shown in the accompanying sketch. The linkage permits the parallels to be placed in innumerable positions yet prevents the from falling over. While the parallels are shown parallel to each other, they can be set at

Contributions for these pages describing short cuts for the tool engineer are welcome. Finished drawings are not necessary. Payment for accepted articles is made upon publication.



various angles just as well. Another advantage found in this device is that the linkage prevents the parallels from becoming separated in the crib or on the bench. In addition, the parallels are lighter than conventional ones since they are narrower than usual. As a further step, lightening holes can be drilled through them if desired.

Clifford Molloy
Bronx, N. Y.

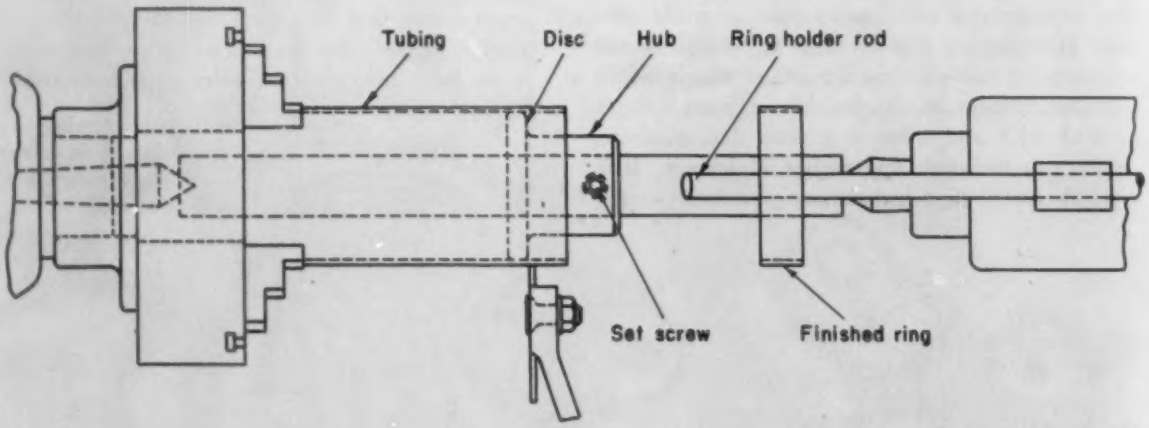
Cutoff Setup for Rings

One of the components for a new instrument assembly being processed for production consists of a thin-wall stainless steel ring. Finding a satisfactory production method of cutting off these rings from lengths of tubing so the parts are square proved quite a problem. A number of methods were tried before the lathe fixture shown in the accompanying sketch was devised.

The basic element is a shaft turned to run true, which is mounted on centers. The shaft carries a disk with a hub on one side. A setscrew through the hub permits it to be locked in position. The shaft has a full-length flat on one side for the screw to bear against. A ring is used in the end of the tube to prevent the chuck from collapsing the tube. A block which holds a small rod is clamped to the tailstock. The clamp is not shown in the drawing.

To cut off a ring the disk is slid inside the tubing to the correct position for support. The disk is then locked in place. The ring is cut off with the parting tool and is hung on the small rod projecting from the tail stock. The disk is then repositioned for the next cut. As additional rings are cut, the rod is pulled out as required to provide space for holding them. With this fixture rings can be cut quickly, square and without distortion.

H. Koslow
Bronx, N. Y.



Sighting Light

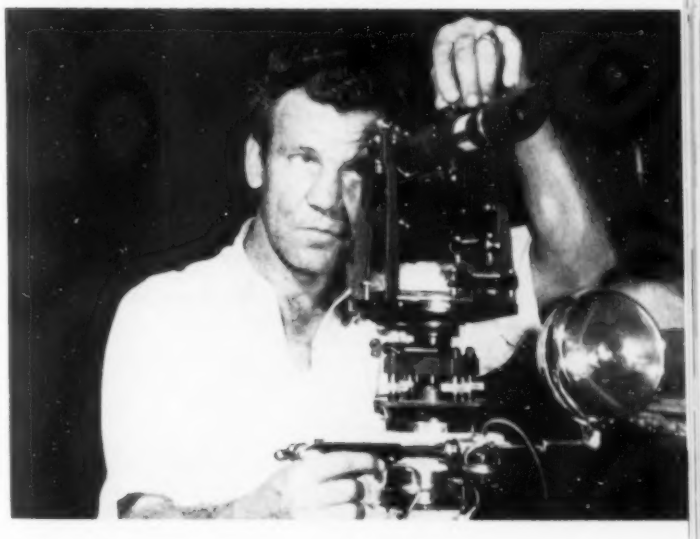
Under ordinary factory illumination, it is difficult for transit men to read minute measurements from the scale they are sighting on. Chance Vought Aircraft tried theatrical spotlights, floodlights, camera slide projectors and extension lamps on cords in an attempt to provide better visibility on the scale. Usually one man was required to hold the light on the scale while a second adjusted it on the jig, in line with the transit man's motions.

A standard automobile spotlight attached to a surveyor's transit is saving the company money and speeding up the job of aligning jigs and fixtures

der construction. Use of the spotlight eliminates e need for the extra light man.

When spotlights were first attached to four transit lumns in the jig shop as a test, it was evident that he idea was a solution to the problem. As an improvement, however, the lights were equipped with olored lenses to eliminate glare on workmen's eyes. A small transformer fastened to the transit base onverts shop current to the six-voltage needed for he light. Average distance at which the spotlight-quipped transit is used is about 15 feet, although ights up to 35 feet can easily be read with the light.

Philip P. Hathaway
and George G. Herrett
Dallas, Texas



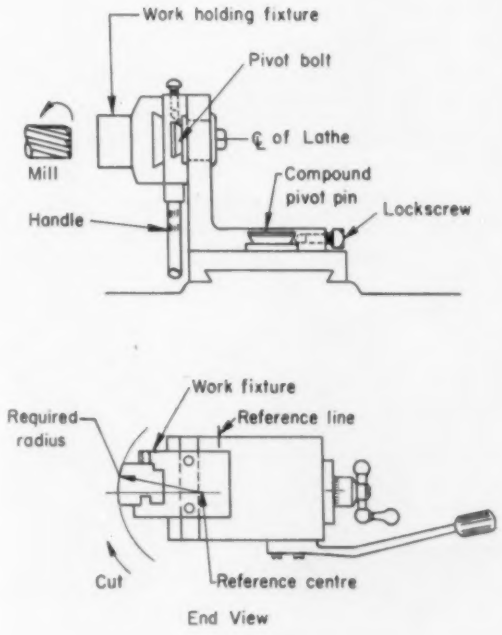
Lathe Attachment for Radius Milling

This attachment for milling radii in a lathe can be readily produced at low cost from materials commonly available. The sketch shows an Atlas type machine but the attachment can be improvised for other types, varying according to the kind of pivot pin and topslide lock.

The topslide is first stripped from the lathe and a sturdy angle plate is made up to fasten on the cross slide. The vertical face of the plate is aligned with the lathe spindle and is bored to accommodate the topslide pivot. The topslide is then bolted to the angle plate so it is free to rotate. A hand lever is fastened to the topslide by machine screws.

The workpiece to be milled is held in a fixture bolted to the topslide in the position normally occupied by the lathe toolpost. The milling cutter is held in the lathe chuck and the work is traversed by use of the hand lever. Different radii can be milled at one setup of the workpiece by using the cross slide for in feed. Advance or retraction is measured on the index dial. The lathe can be restored to normal operation in a few minutes.

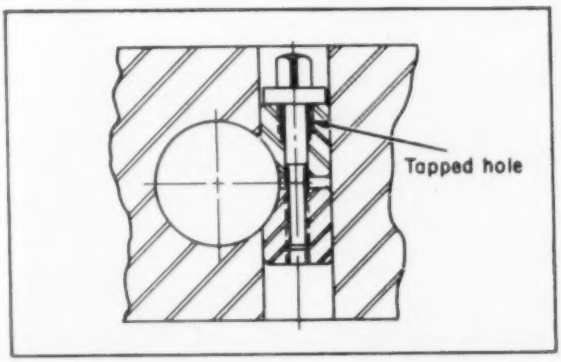
Ian J. Peacock
Cumberland, Britain



Removing Frozen Boring Bars

Binder type clamps used on some turret lathes often freeze so boring bars cannot be removed. By tapping a hole in the top clamp larger than the screw, the clamp can be loosened or removed. This is readily accomplished by inserting a bolt that protrudes above the bar holder in place of the holding screw, striking it to loosen the bottom clamp. The top clamp can then be jacked out by using a heavy washer on a bolt inserted in the hole tapped in the upper clamp.

Ernest Egger, Joliet Chapter



induction heating for large weldments

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and

A. Lüthy

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WITH BUT FEW EXCEPTIONS, every industry either directly or indirectly uses complicated structures that could not be made except by arc welding. Material requirements and operational uses of many such structures have made necessary the development of special welding techniques. One of the most important of these is the application and control of heat both before and after welding. Contrary to popular conception, high-frequency induction heat can be economically justified for such use.

This application of induction heating equipment involves the usual simple principles of induction heating. An inductor coil is placed on a part to be heated to make a simple transformer circuit. The coil is the primary and the part is the secondary. High-frequency current flows in the inductor to induce a flow of current in the work, which generates heat through ordinary resistance losses. The material being heated need not be magnetic but must be a conductor of electricity.

Need for Preheating: The use of high-quality steels in the construction of many assemblies is becoming more necessary. Plain carbon steel is strong enough where high temperature is not involved but when the operation is at elevated temperatures, chromium, molybdenum and other alloying agents must be used. Care must be exercised during welding of high-alloy steels to prevent metallurgical changes from taking place. Preheating is necessary to avoid extreme hardening of the transition zone between the parent and weld metals. Preheatinng must take place between carefully controlled temperature limits.

Need for Postheating: Distortion and cracking, which sometimes occur after a welding operation, are caused by the presence of unevenly distributed internal stresses set up as the molten metal shrinks during solidification. When damage occurs, it means that the resultant forces are greater than the elastic limit of the material. In a structure of relatively thin sections, these stresses are more easily distributed than in heavier structures.

Some structures can be produced with no difficulty by carefully selecting the welding method to reduce internal stress formation. Many other parts are subject to low static strain in use and some residual stress is not harmful. Any large forging or casting that has been welded, however, or a complete weldment subjected to considerable stress in subsequent use, must be stress relieved, usually at about 1100F.

This treatment should be carried out immediately after welding, so that cooling is avoided, otherwise the quality of the joint may be seriously impaired. This is especially true with high-carbon steels.

Methods of Heating: Furnaces are generally limited to postheating a complete assembly of com-

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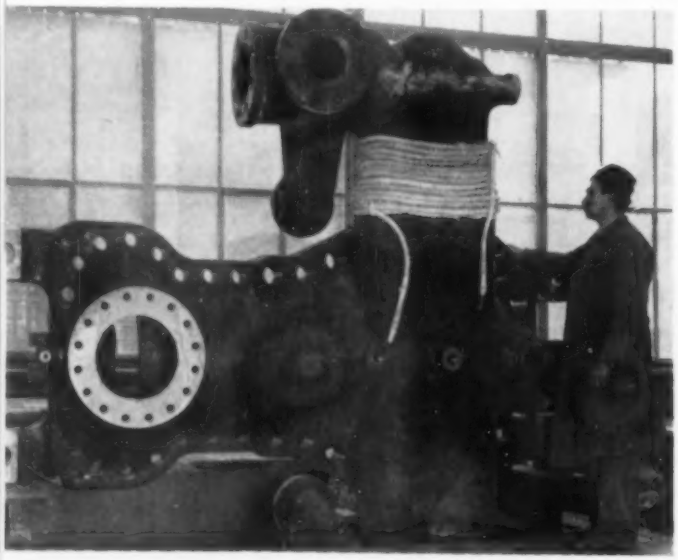


Welded joint of high-pressure cast steel steam turbine casing prepared for stress relieving with induction heating. Insulation blankets are removed so the inductor is visible.

plicated form with large dimensions. Some preheating has been done with rings fed by gaseous or liquid fuels, but this has frequently been impractical because control has been difficult.

Resistance heaters are expensive and difficult to apply because of the variety of shapes necessary. The accurate control of temperature through nonuniform cross sections is extremely difficult. Resistance elements are generally operated at maximum output and their lives are short. Resistance heaters occupy a large space and restrict access to the joint by the welder.

Starting in 1936, Brown, Boveri (Switzerland) began preheating large steel structures with low-frequency induction heating equipment. They established preheating temperature limits of 750 to 850F and postheating limits of 1100 to 1200F. Because 50-cycle power was readily available, this frequency was used. From a theoretical standpoint, frequencies of 50 or 60 cps offer advantages of simplicity, depth of penetration and reasonable power factor. From a practical standpoint, however, it was found that low frequencies were difficult and sometimes impossible to use.

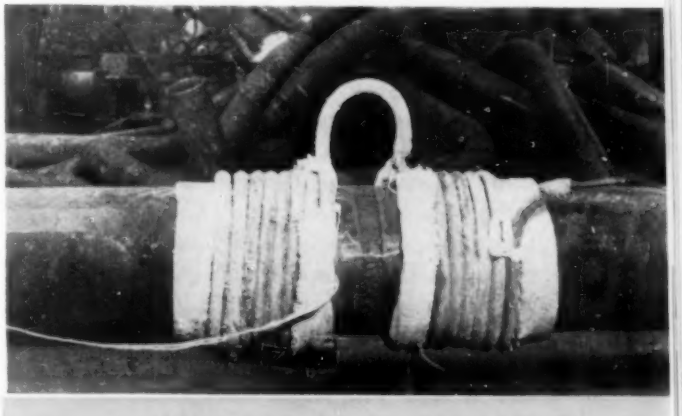
Because of this, Brown Boveri performed many experiments to determine the most suitable frequencies for heating operations. Their tests included many production runs using 16 2/3, 50, 500, 3000 and 10,000 cps, all of which were successful. However, from practical and theoretical standpoints, they determined that a frequency between 2000 and 3000 cps was most advantageous for heating sections from 200 to 100,000 pounds.

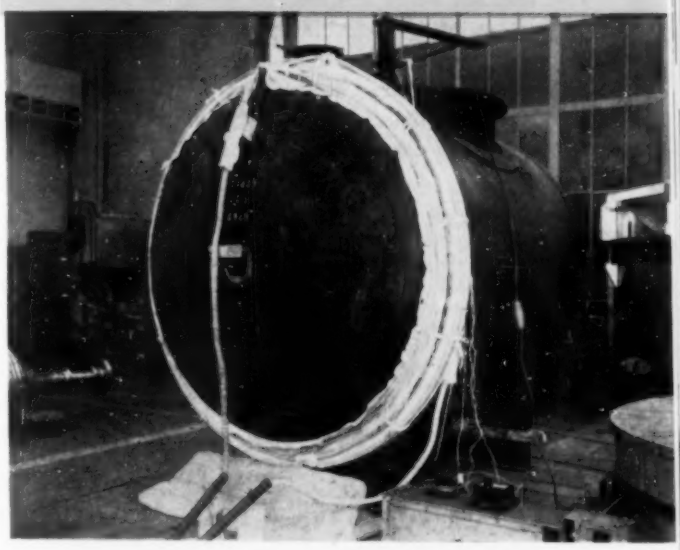
While 60-cycle current does have a greater depth of penetration, the number of turns required in inductor coils at this frequency is three to four times more, to obtain the same heating effect, than with a frequency of 2000 to 3000 cps. The 60-cycle inductor is large and difficult to place, especially if it has to be moved from its preheating position to a postheating position. Also, a 60-cycle inductor must be made carefully with no overlapping turns if the efficiency is to remain high.

To rid a 6500-lb part of internal stresses by postheating at approximately 1150F would require 50 kw of power. A 60-cycle inductor would contain 1400 feet of cable while a 3000-cycle inductor would require only 215 feet. This represents a substantial saving in cable and considerably eases placement of the inductor on the workpiece.

Induction Equipment: Standard high-frequency induction heating equipment usually consists of a motor, generator and controls operating with an output frequency of 3000 cps. Condensers, necessary for correcting power factor, should be as near the inductor coil as possible. Ordinary cables are used between the generator and the inductor and are placed close together. Excessive lead lengths are avoided to reduce line losses. When the generator is at a distance of more than about 75 ft, coaxial cables or bus bars are required. Bus bars are only justified on production installations.

Generally, power from the generator is used in several inductors at the same time. This is accomplished by having a voltage regulator on the generator and by feeding the power through tapped transformers to the inductor coils to adjust the amount of power. In such instances condensers are





(Above) To prepare a joint for welding in 10-inch OD, 9/16-inch wall thickness pipe for live steam, inductor parts are together. During welding, the inductor parts are separated and induction power is turned off to prevent the welding arc being extinguished by the magnetic field. After welding, the inductor parts are moved together for postheating.

(Below) The welded flange on the lid of a 170-psi water evaporator is stress relieved at 1150F. Flange is 79 inches in diameter with a plate thickness of 5/8 inch. Temperature was increased at the rate of 135 deg per hour and reduced at rate of 45 deg per hour. The evaporator is shown without insulating blankets.

connected across the primary of each transformer.

With most high-frequency installations requiring multiturn coils, inductors are generally made of water-cooled tubing. However, there are times when such coils would be dangerous. More important than the possibility of a coil bursting, is the fact that such inductors are difficult to construct and inflexible for adaptation to a variety of shapes. Such construction is also expensive.

Brown Boveri decided to use cables that were not water cooled and initial designs consisted of copper cable with a double layer of glass fiber insulation covered with an outer coating of asbestos. Terminals were brazed to the ends of the cables. Such turns can be connected in parallel or in series, depending on electrical requirements. These cables were satisfactory but experience showed they had certain defects.

During preheating operations at about 500F their use was acceptable. The insulation, if damaged, could be repaired on the spot. At higher temperatures, however, for example postheating at 1150F, the copper oxidized readily, was reduced to a powder and the cross section quickly diminished. In one instance a copper cable consisting of wires 0.030 inch in diameter was reduced to one-half its original cross section at the end of 150 hours of use. A cable with larger wires would have longer life, but being less flexible would be more difficult to use. A $^{9}/_{16}$-inch diameter cross section cable consisting of 0.100-inch diameter wire would be suitable for a large section but would not serve for a small diameter because of bending difficulty.

After a considerable amount of experimentation, Brown Boveri standardized on the use of an alloy of copper and zinc which resists oxidation up to a temperature of about 1400F. Such cables, if carefully handled, have a life of several thousand hours and require only occasional replacement of insulation. While the electrical conductivity of this alloy is lower than that for copper, the slight increase in electrical losses is negligible in comparison with the advantages inherent in this material. Since the additional loss results in heat, the electrical loss does not end up as a total loss to the operation.

Cables that give the best results are from 50 to 75 feet long, have brazed-on terminals, are insulated with a double thickness of glass fiber insulation and covered with two asbestos tapes wound in opposite directions. The best section area seems to be between 0.15 to 0.23 sq inch, made up of wires 0.030 to 0.050 inch in diameter. Cables are usually braided since stranded cables are not flexible and show a tendency to wear. Cables that run in parallel may be connected to terminals.

Typical of jobs done by Brown, Boveri with Tocco high frequency induction heating equipment is this 12-ton rotor arranged for stress relieving. Thermal insulation is in position over the inductor and thermocouples.

Power Requirements: The power required depends upon the type of heating to be carried out. Postheating for stress relieving of a welded joint on a heavy pipe requires more power than is needed for a similar weight of metal in an ordinary shaft. Insulation plays an important part and should be used to avoid unnecessary losses. Thorough blanketing is necessary to keep the heat in. For heavy pipe, approximately 0.1 kw per pound of metal is recommended, while for a machine part the requirement would be about 0.002 kw per pound.

For either postheatinng or preheating, the time element is dependent on the dimensions and thickness of the heaviest section if distortion and cracking are to be avoided. If the external application of the inductor is impossible and it has to be placed inside the part, an increase of as much as 50 percent in power may be necessary to offset both the less efficient coupling and external radiation.

Current in inductors is limited to between 50 and 250 amp to permit use of small cross section cables that are not rigid and to avoid terminal problems.

Conclusions: Preheating and postheating of large weldments with high-frequency induction equipment operating at 2000 to 3000 cps is the only method that permits the necessary control of all the factors for proper heating whether the work is done in the manufacturer's plant or on the job. Temperature can be controlled by thermocouples in any required numbers placed wherever needed. With a properly designed inductor, it is only necessary to vary the current to give the required temperature. By varying the time and power after temperature is reached, any temperature can be induced in the work and maintained.

machinability of Boron-Treated Steels

By F. J. Daasch*

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NEED FOR conservation of alloying elements during the recent shortages of chromium, nickel, manganese and molybdenum has encouraged further studies in the preparation and fabrication of boron-treated steels. If the shop should have difficulty in machining these substitute steels, the savings effected by conservation of alloying elements would be offset by processing problems. Although the relative tonnage of boron steels produced has been small, many tons of critical ferroalloys have been saved, principally nickel, through the use of these steels.

In the study of machining characteristics, tool-life tests have the greatest use for commercial applications. Results from this type of test are presented in this article for certain standard steels and corresponding boron-steel alternatives. Throughout the tests, a standard 16-inch engine lathe having a variable speed drive was used. Right-hand tool bits in one-piece holders were set with a constant overhang and with the cutting edge on centerline. Commercial-grade high-speed steel tool bits (18-4-1) from the same lot were used with the following angles: 0-deg back rake, 15-deg side rake, 5-deg end and side relief, 5-deg end cutting edge, and 0-deg side cutting edge. The nose on each tool was ground to a radius of 0.005 inch. The same grinding procedure was maintained throughout the tests and a 120 grit wheel was used for finish grinding. During the machining tests the tools were flooded with a soluble oil diluted 20 to 1.

Two-foot test logs were furnished from regular stock. Nine separate test groups were run using 4140, 4340 and 8740 steels treated to different hardnesses and corresponding boron-steel alternatives treated to the same hardnesses. Heat-treatment data for six of the tests are listed in TABLE 1. All conditions of the tests were controlled as much

Table 1—Heat Treatment Data for Steels Tested

Test Group	Material*	Hardness (Bhn)	Heat Treatment
1	4140	269	1550F, oil quenched, tempered
	14B50	269	1550F, water quenched, tempered
2	4140	202	1550F, cooled in furnace
	14B50	176	1380F, annealed
3	4140	340	1550F, oil quenched, tempered
	80B40	321	1550F, water quenched, tempered
4	8740	277	1550F, oil quenched, tempered
	80B40	269	1550F, water quenched, tempered
5	4340	217	1550F, cooled in furnace
	86B45	196	1525F, cooled in furnace
6	4140	302	1550F, oil quenched, tempered
	80B40	302	1550F, water quenched, tempered

*Materials having "B" numbers contain boron.

*Senior member ASTE Tri-Cities chapter.

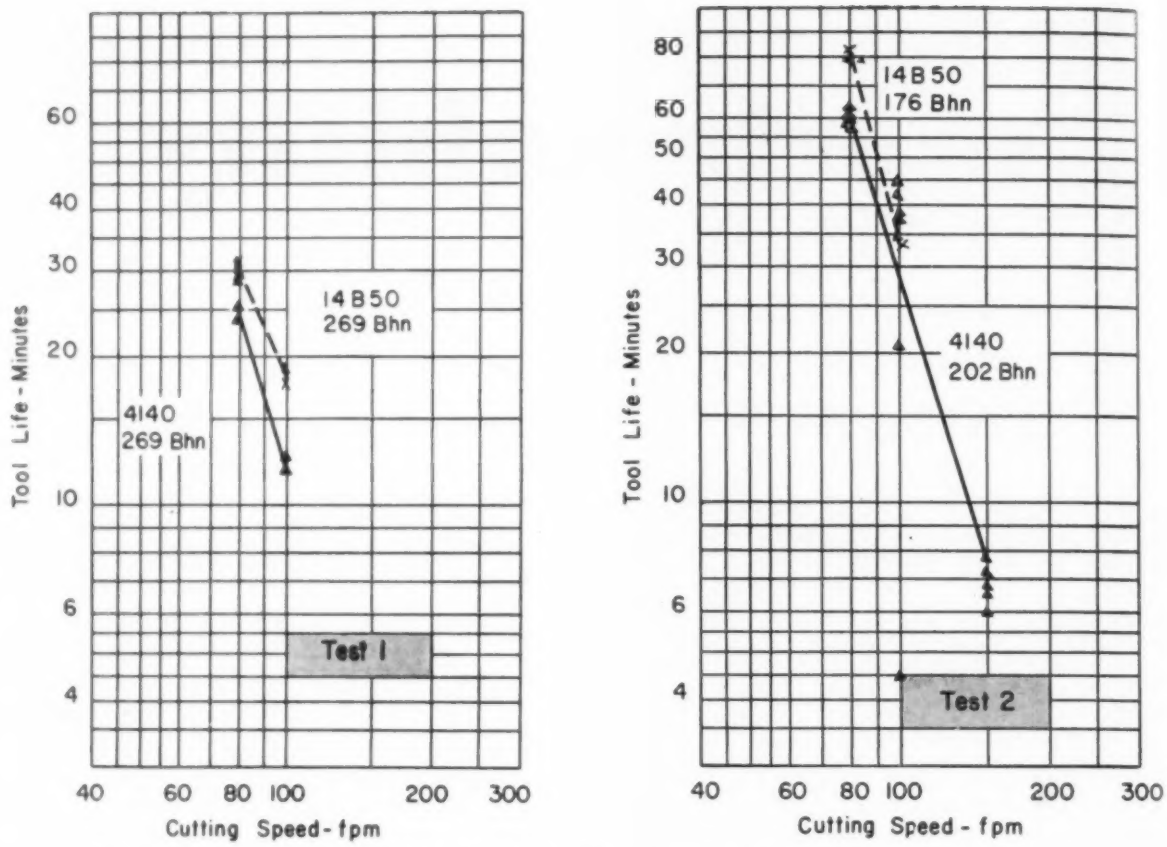
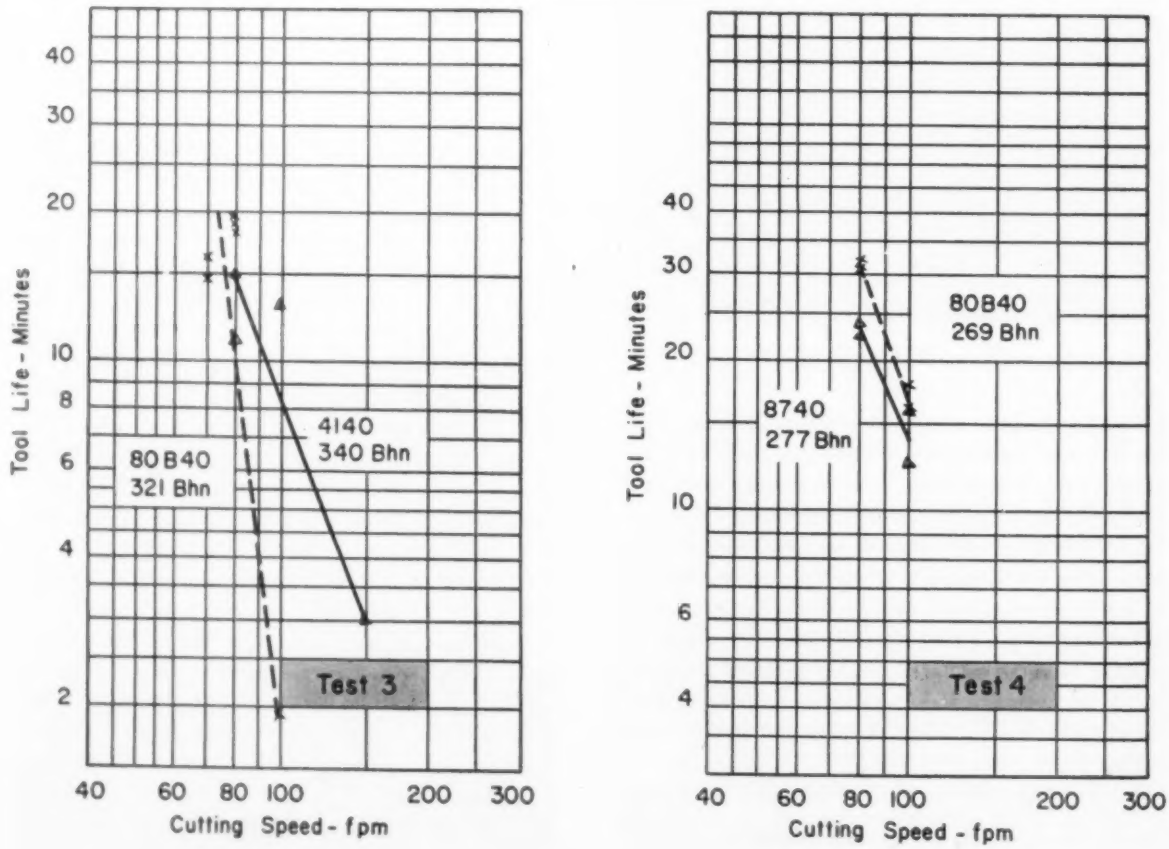


Fig. 1. Tests results comparing machinability of heat-treated steels and boron-steel substitutes.



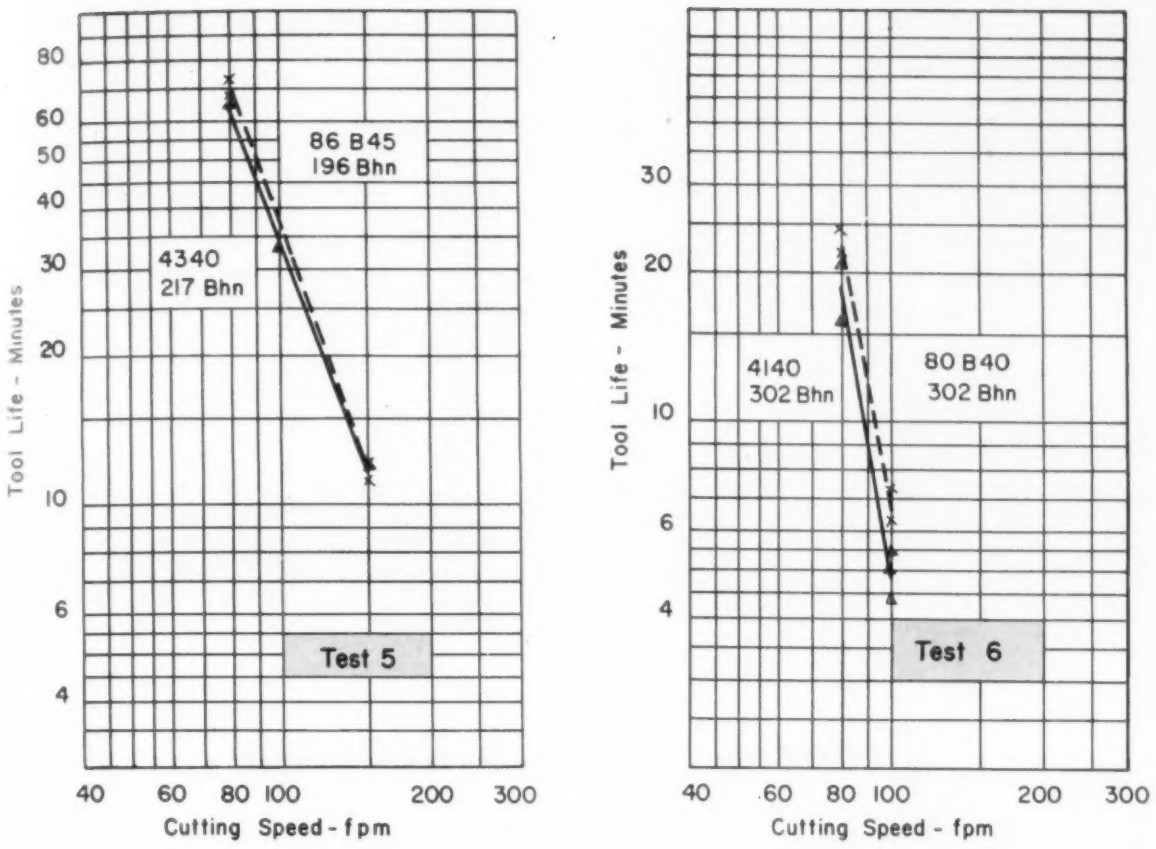
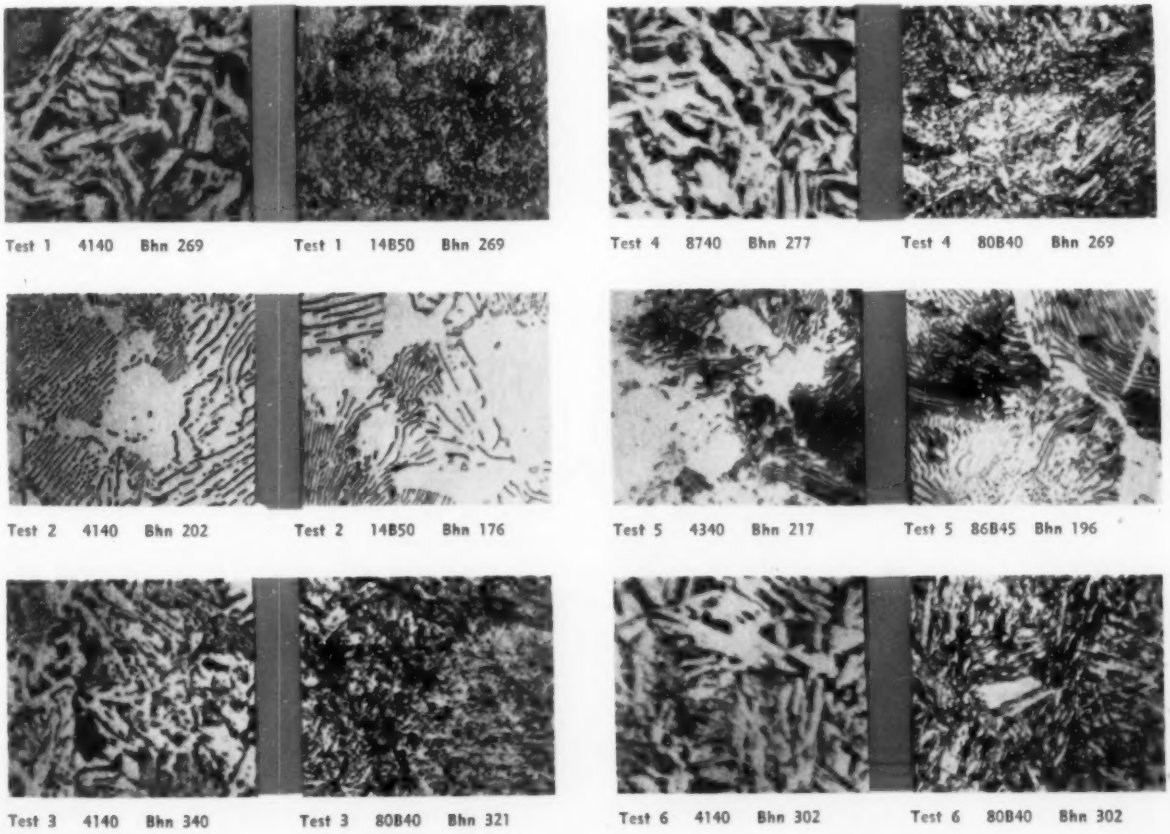


Fig. 2. Photomicrographs showing structure of the steels used in machinability tests.



as practical to limit the variables to one, the material being cut.

If a definite amount of tool wear is assumed to be the criterion for regrinding, it is possible to establish tool-life values. These values were determined with a depth of cut of 0.062 inch and a feed of 0.009 inch. Tool failure was considered to be 0.060 inch of flank wear. This wear was measured with a Brinell microscope.

Results of the test groups listed in TABLE 1 are shown in *Fig.* 1. When plotted on log-log paper with the cutting speed and tool life as coordinates, the results should approach a straight line. Deviations on check runs made for each test condition exceeded ordinary expectations. These deviations are attributable to inaccuracies in test procedures and inability to stop the run at the precise predetermined amount of tool wear.

Photomicrographs, *Fig.* 2, of the steels used in the four tests tabulated indentify the structures involved in these tests. The specimens were taken from a section midway between the center and the outside surface of the test log. All specimens were picral etched and are shown at 1000X magnification. No conclusions have been established for the relationship between microstructure and machinability because of the limited sampling.

Comparison of the graphical results, *Fig.* 1, for machining 4140, 4340 and 8740 steels and boron steel substitutes indicates that the machining characteristics are essentially the same although the results of the test generally favored the boron steels.

ACKNOWLEDGMENTS: Appreciation is extended by the author to the Office of Chief of Ordnance, U. S. Army for permission to publish these data and to associates for their assistance in the work.

Economy through Redesign

RECONSIDERATION of their operations has paid off for General Electric Co. and served as an example in favor of periodic examination of work, design, and methods in the factory. The case involved was the bearing assembly of a naval gun director.

This unit is comprised, in major part, of three rings. By converting to forgings, G-E realized several advantages including simplified and faster production and reduced fabrication costs.

One of the rings is a stationary 50-in. OD inner ring which rests on a worktable. It is a circular channel with two external flanges. By converting to a forged ring, rolled to shape by Standard Steel Works Div. of Baldwin Lima Hamilton, the engineers did away with a weldment consisting of five rings cut from steel plate. This change resulted in simplified fabrication, including a reduction of machining, lowered cost and production time and improved quality of the part.

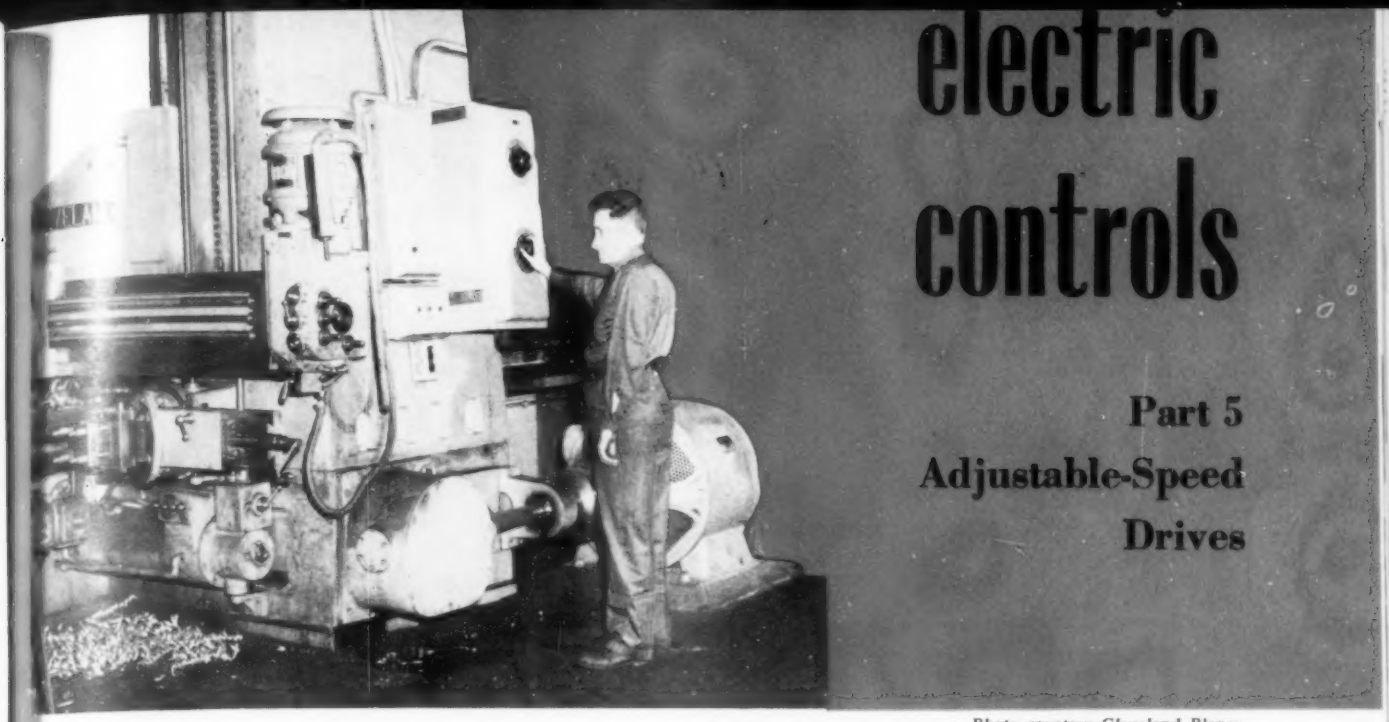
A bearing design change simplified and increased production, and reduced fabrication costs.

Also, changed from a steel casting to a forging was the 57-in. OD turntable ring which is the rotating outer support for the gun director. Making this piece a forged ring brought about improved uniformity and stability of the metal while improving its machinability and reducing the amount of machining required.

Proper heat treatment by Standard Steel after a roughing cut, and finishing machining by G-E gives a tolerance of 0.002 in. on a 50-in. bore and a runout limit of 0.001 in. from a perfect circle. Besides, in the quantity required, forging the rings cost less than casting them.

Precise accuracy is required of the ring gears, and the qualities produced by hardening and heat treatment of the forged rings are first considerations in ring specifications.

Both smooth rotation on the roller bearings and accurate positioning without backlash depend on heat treatment and precision machining. With the present handling, less than 0.001-in. runout on the diameter after machining and assembly is obtained.



electric controls

Part 5 Adjustable-Speed Drives

—Photo courtesy Cleveland Planer.

Fig. 1. Planer uses a-c to d-c adjustable-voltage system to obtain extreme speed ranges.

By John C. Ponstingl

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ACCURATE CONTROL and adjustment of machine speed are vital keys to operation flexibility and high production. Also, the ability to precisely adjust speed on machines, such as the planer illustrated in *Fig.* 1, results in better finishes and longer tool life.

A wide range of speed control is available in drive units which have been developed to take advantage of the qualities of a-c power supply systems, and the speed and torque characteristics of d-c motors. TABLE 1 illustrates a logical grouping of basic control elements, along with the conversion units, needed to link an a-c power supply to a d-c motor. When the drive requires more than several hundred horsepower, the a-c motor may be a synchronous type to provide power factor correction.

Three forms of basic conversion equipment are normally used. They are the motor generator set, the metallic rectifier, and the electronic rectifier. Choosing the best type of conversion unit for a particular application involves careful consideration of original cost, space and mounting requirements, maintenance, voltage regulation, speed range, speed regulation, and motor size.

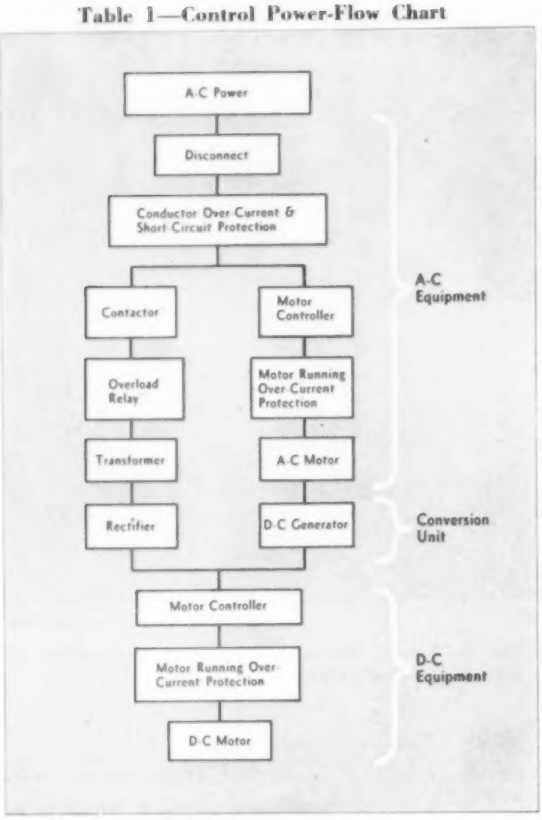
Constant Voltage

In the simplest case where it is only desirable to convert alternating current to constant-voltage, direct current for d-c motors of 50 horsepower or less (or for accessories such as d-c brakes, magnets and clutches), the best devices to use are either metallic rectifiers or motor-generator sets. A typical case would be where a plant replaced a 230-volt d-c distribution system by a more economical 440-volt a-c system. On-the-spot a-c to d-c conversion units make it possible to use any existing d-c motor-driven tools, such as lathes, grinders or drills. *Fig.* 2 illustrates the cost trend for comparative conversion systems. For 15 kw ratings and lower the dry-type rectifier generally has the advantage in price compared with a motor-generator (m-g) set. It is also a static device, *Fig.* 3, and requires less consideration when mounting. Many times, the rectifier power pack is hung on the wall above the machine, conserving valuable floor space.

From the standpoint of maintenance the metallic rectifier has a distinct advantage. Aging taps are provided on the transformer to compensate for slight change in rectifier characteristics during the first or second year of operation. After that, no special maintenance is required. Motor-generator sets require commutator maintenance and replacement of brushes. Voltage regulation of metallic rectifiers is approximately 10 per cent for a self-cooled and about 15 percent for a fan-cooled selenium rectifier. Regulation of the motor-generator set is superior, ± 3 percent being obtainable by flat compounding at no price increase.

Space requirements are, in general, greater for the motor-generator set than for the metallic rectifier. With some exceptions, the basic d-c control

Table 1—Control Power-Flow Chart



*Normally included in standard rectifier packages

components are still used to provide the necessary motor control and protection features (covered in Part 4 of this series).

Normally, when a d-c motor larger than 2 hp is connected to a constant d-c voltage power supply, resistors must be used to limit the starting current to the motor. If a rectifier supplies power to a single motor, then the a-c linestarter used to energize the rectifier can also function as the d-c motor starter since the rectifier has sufficient internal resistance to limit the d-c motor starting current. D-c motors up to 7½ hp can be started this way. The overload-relay heaters in the a-c linestarter would necessarily be selected to give motor-running over-current protection to the d-c motor. In applications where regenerative braking must be employed, the rectifier cannot be used without modification since d-c power cannot be pumped back into the rectifier unit.

Since d-c voltage from a rectified single-phase a-c system is pulsating with approximately 48-percent ripple factor, some consideration may have to be given to the additional heating (due to eddy currents) developed in the d-c motor. For example, if a 1-hp motor drives a particular machine (with an m-g set type of d-c power source) and the power source is changed to a single-phase rectifier type,

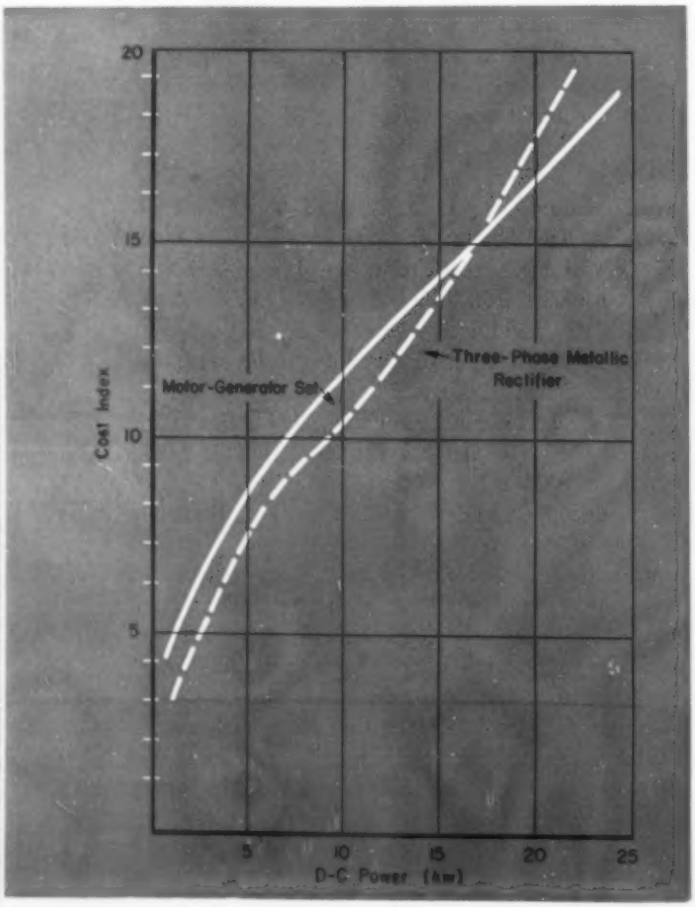
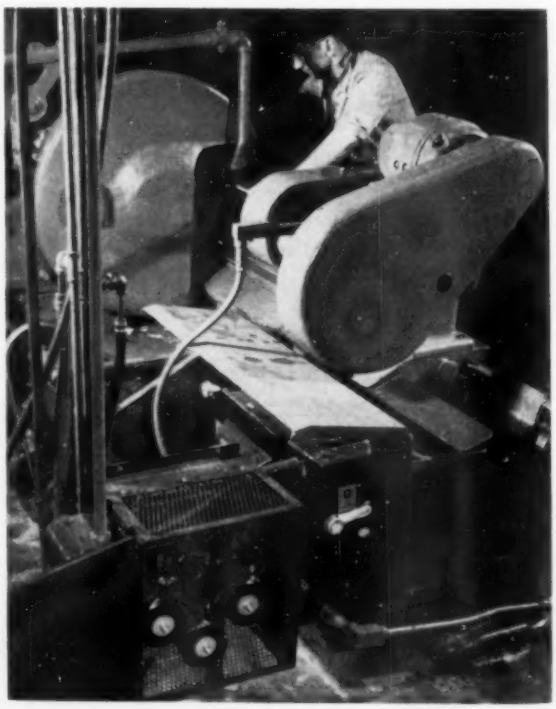


Fig. 2. (lower left) Comparative costs of conversion systems for supplying 230 volts d-c from an a-c power supply.

Fig. 3. (below) Metallic rectifiers are practically maintenance free and can be mounted almost anywhere to supply d-c power from an a-c source.



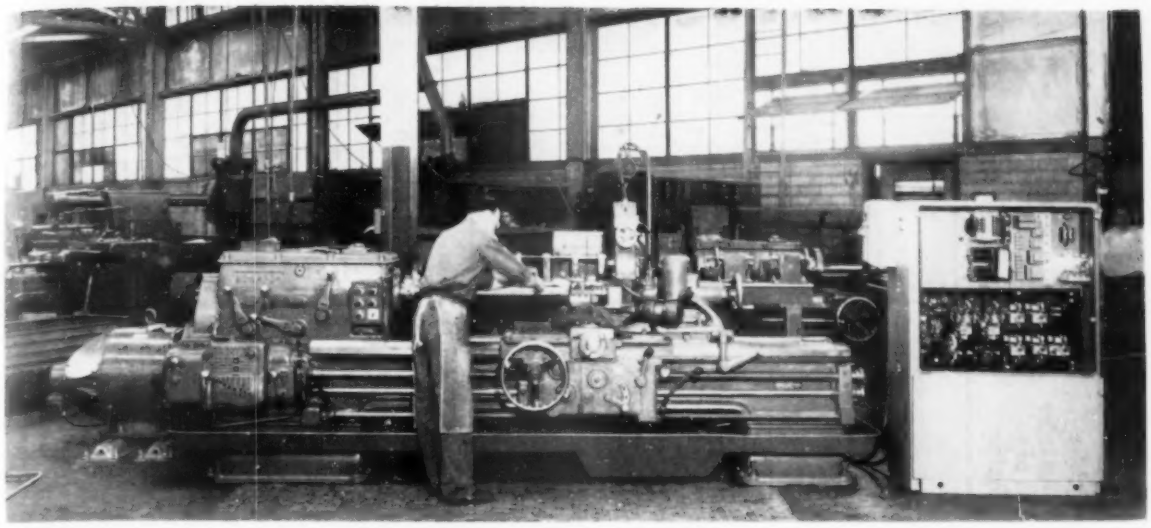


Fig. 4. Automatic motor control and adjustable-voltage motor-generator set are conveniently packaged and mounted next to the driven lathe. The conversion unit makes possible constant cutting speeds for better tool life and higher production.

the resulting ripple voltage may affect the capacity of the motor. Because of the added losses caused by the pulsating nature of the armature current and the greater difficulty experienced on commutating this current, it may be necessary to use a motor built in a larger frame to deliver a full 1 hp to the drive. Single-phase electronic rectifiers range in size to approximately 50 hp, and also encounter this problem. They are discussed later in this article.

Three-phase rectifier systems, on the other hand, produce approximately 4-percent ripple and consequently are more desirable to use than the single-phase units. Tests and shop experience prove that commutation and heating of the normal motor, such as used on machine tool service, are not adversely affected by a 3-phase rectifier supply.

Speed control can be obtained by using a field rheostat, armature resistance or both. Poor speed regulation, however, is associated with speed control by armature resistance. If speeds greater than 2 to 1 by field control are needed, an adjustable-speed type d-c motor must be used. With constant voltage applied to the motor armature it is possible to obtain speed ranges from base speed up to 4 times base speed by field control. Special motors are available with 6 to 1 and 8 to 1 ranges.

Adjustable Voltage

To obtain speed ranges higher than 2 to 1, while still using the standard constant-speed motor, and to eliminate the power losses in the field and armature resistors, adjustable-voltage control schemes are used. Adjustable or variable-voltage power conversion units are simply refinements of the constant potential variety, permitting increased flexibility of control of d-c motors. Instead of producing a constant voltage d-c output, pilot controls are added to the conversion unit to adjust the d-c output.

With constant voltage applied to the motor armature, its speed can be increased 2 to 1 by field control, producing a constant-horsepower drive. Further speed changes are obtained, producing constant-torque from the motor, by keeping the field-voltage constant and reducing (or sometimes increasing) the motor armature voltage. In the case of a motor-generator or Ward-Leonard drive, simply controlling the generator field voltage changes the d-c voltage to the motor armature.

Electronic rectifiers use grid-controlled thyratrons to supply adjustable voltage to the armature of a d-c motor. Thyratrons may also be used to supply the field of the motor when part of the speed range is to be obtained by motor-field control. Speed ranges up to 50 to 1 with constant torque by armature-voltage control are available.

To increase the flexibility of the d-c motor, other control functions such as reversing, inching, dynamic and regenerative braking, controlled acceleration and deceleration, and automatic regulation of speed, torque, current and position can be conveniently built into the conversion unit. By combining the electrical characteristics of generators, electronic tubes and magnetic amplifiers, more features can be obtained electrically than from any other drive.

Often, the motor-generator set, the a-c control and the d-c control are all conveniently packaged in a single enclosure as illustrated in *Fig.* 4, minimizing installation time and also cutting the cost of installation. By selecting the generator equipment to have exactly the capacity required by the d-c motor, more economical drives are obtained than when using a combination of individual components. TABLE 2 shows this cost comparison using

Table 2—Comparative Chart for Typical A-C to D-C Motor Control Systems

Conversion System	Basic Principle	Typical Speed Range			Basic Price Index Including Motor & Control		Advantages of System	Disadvantages of System
		Constant Torque (ratio)	Constant Horsepower (ratio)	Speed Obtained (rpm)	5 HP	25 HP		
Motor-Generator Set (constant voltage)	A d-c generator is driven by an a-c motor to provide constant-voltage d-c power. Speed control is obtained by inserting resistance in series with the motor field or motor armature.		2 to 1	2300 to 1150 1700 to 850	145 149	360	Simple device. Regenerative braking available.	Brushes must be replaced and commutator must be maintained. Rotating equipment requiring solid foundation. Larger frame-sized motors required for speed ranges over 2 to 1. Space requirements greatest of the group.
			4 to 1	1800 to 450	186	425		
			8 to 1	2400 to 300 2000 to 250	223	534		
		5 to 1		1750 to 350	149*	355*		
Metallic Rectifier (constant voltage)	3 phase a-c power is converted by metallic rectifier to d-c. Speed control is obtained by inserting resistance in series with the motor field or motor armature.		2 to 1	2300 to 1150 1700 to 850	118 127	346	Practically no maintenance required. D-c motors up to 7½ hp can be linestarted using the rectifier regulation to limit starting current. Installation costs lower than m-g set. Good for constant-horsepower applications such as lathes, etc. Light weight. No inrush on starting. No warm-up time. Good power factor. High efficiency.	Motor power cannot be pumped back through the rectifier for braking. Speed regulation is not as good as other conversion supplies.
			4 to 1	1800 to 450	162	380		
			8 to 1	2400 to 300 2000 to 250	198	489		
		5 to 1		1750 to 350	140*	350*		
Motor-Generator Set (adjustable voltage)	A d-c generator is driven by an a-c motor. By generator-field control, adjustable voltage is applied to the motor armature to provide constant-torque speed control. Inserting resistance in the motor field produces constant-horsepower speed control.	8 to 1		1750 to 218	95	305	Uses smallest motor (constant speed) for comparable speed ranges. Good speed regulation with automatic controls. Wide variety of control features available. Least expensive for constant-torque drives such as conveyors.	Brushes must be replaced and commutator must be maintained. Rotating equipment requiring solid foundation.
		8 to 1	2 to 1	1700 to 106 2300 to 144	108	354		
Electronic Rectifier (adjustable voltage)	Grid-controlled thyratron (or Ignitron) rectifier tubes supply adjustable voltage to the motor armature and field.	5 to 1		1750 to 350	166	504	Installation costs lower than m-g set. Most compact package. Can be mounted anywhere. The speed control rheostats are very small radio-type potentiometers. Extreme flexibility of control. Excellent speed regulation. Wide variety of control features. Best for extreme speed ranges.	Tubes require replacement. Tube warm-up time usually required before the drive can be operated. Due to ripple factor the d-c motor may be one or two frame sizes larger than m-g set type drive. Usually most expensive of the group.
		20 to 1		1750 to 88	169	517		
		25 to 1	2 to 1	2300 to 46	169	544		

*Manual d-c control. All others magnetic.

arious systems for adjustable-speed drives.

The electronic rectifier unit as shown in *Fig.* 5 offers increased flexibility as a packaged device. Because it has no moving parts and is more compact than an equally rated m-g set, the electronic conversion unit is often mounted on the wall or on the machine, as shown in *Fig.* 6. In this application, the entire mechanism is movable. By mounting the electronic package as part of the mobile machine, expensive collector and cable reel devices are eliminated.

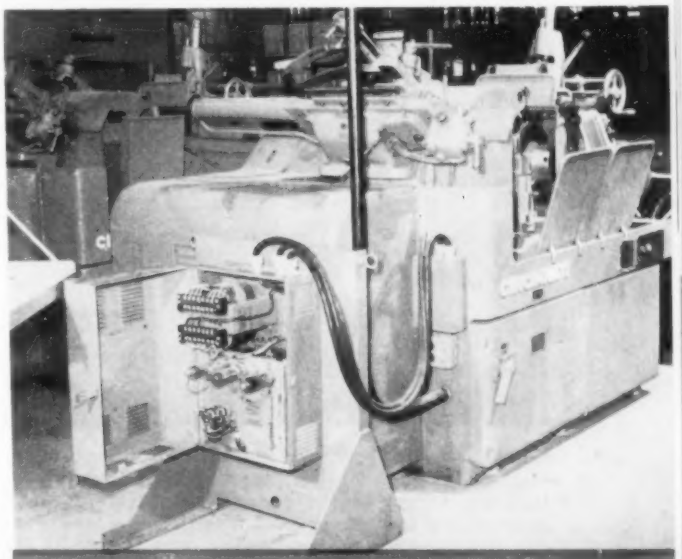
When choosing a drive where the motor is to operate at very low speeds, it is important to check the motor manufacturer to make sure that the motor can produce its rated torque at low speeds, without overheating because at these speeds the ventilation of the motor is materially reduced. Many times, such as in planer drives, where the motor may be required to run at slow speeds, a separate blower provides the necessary motor ventilation.

The speed regulation of any system reflects the normal speed regulation of the d-c motor being used. (Speed regulation is defined as the percent change in speed from no-load to full-load with respect to full-load speed.) At the base speed of the motor, regulation is usually approximately 10 to 15 percent. With field weakening, the change in motor speed between no-load and full-load increases, however, the percentage change stays approximately the same. The change in speed (between no-load and full-load) remains essentially the same when the speed is reduced by armature voltage. The percent-speed regulation goes up, however. At speeds less than $\frac{1}{10}$ base speed, the regulation may approach 75 to 100 percent.

To improve the speed regulation, even as much as plus or minus $\frac{1}{2}$ percent, automatic speed control systems using either rotating, electronic or magnetic amplifiers can be used. On precise speed regulators a tachometer generator is often used.

An adjustable-voltage system is the most versatile means of coordinating several machines and keeping them in close step at all speeds. The motor armatures can all be connected across one generator with simultaneous speed adjustment by varying the generator voltage. For adjustment of individual motor speeds, in their relationship to each other, individual motor-field controls can be used. Small booster generators are sometimes connected in series with the armature of a particular motor to change the resulting armature voltage and corresponding speed of that motor relative to the other motors in the system. These methods work well in metal-processing lines where all motors must stay in step for various line speeds while the motors unwinding or rewinding the metal strip must change speed to compensate for coil build-up.

Electrical drives discussed in this article are by no means the only methods for obtaining speed control. Many mechanical, hydraulic and magnetic clutch systems provide economical adjustable-speed drives. There has been, however, an increased demand for electrical drives because of their extreme control flxibility and relative freedom from maintenance. With the addition of pilot-control circuits, adjustable-voltage drives can be made to satisfy practically all of the varied drive operations in industry. Pilot controls, in combination with standard a-c and d-c power controls, as well as with adjustable-voltage systems play an important role in automation and in industry's progress in improving and refining production methods. They will be discussed in the next article.



—Photo courtesy Seruga Rubber Co.

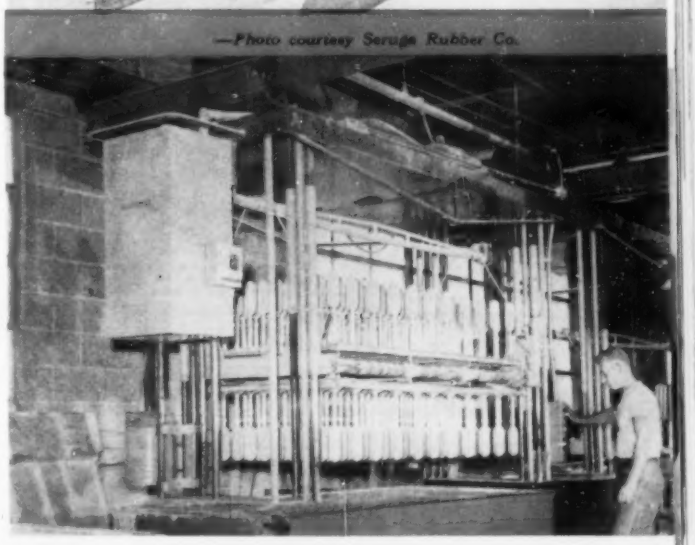


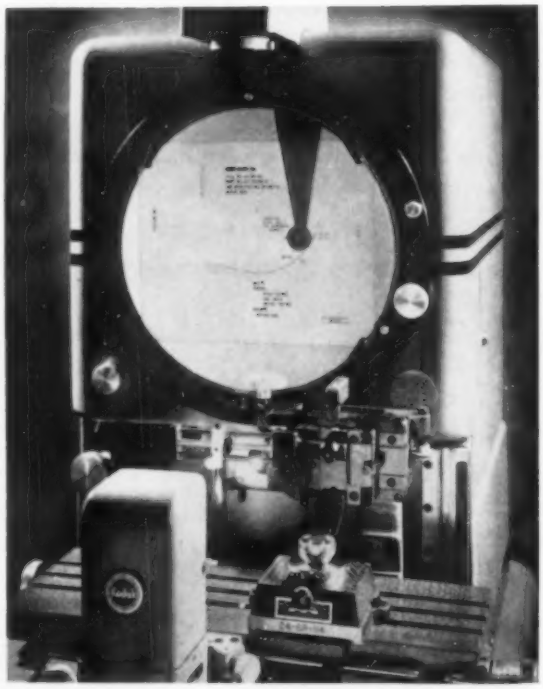
Fig. 5. (top) Electronic rectifier package is compact and is mounted convenient to the machine.

Fig. 6. (bottom) Electronic rectifier package is mounted on movable dip tank mechanism, eliminating costly collector systems.

designed for

PRODUCTION

Hidden Contours Gaged by Optical Comparator

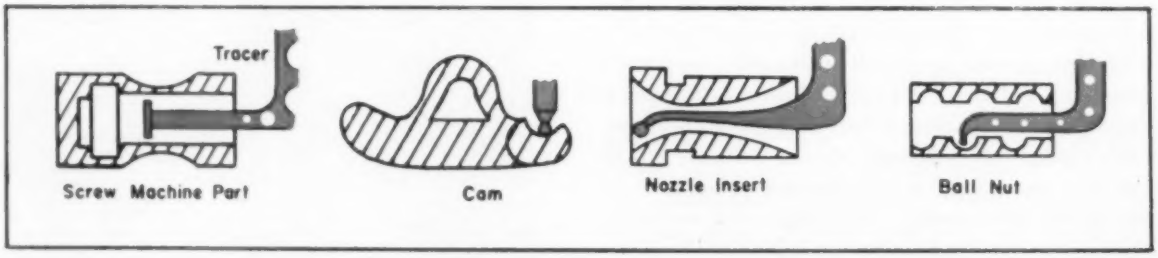


TRACER IS USED with standard contour projector to gage the internal dimensions of a ball joint bearing. The target in the beam from the light tower appears on the screen and exactly duplicates the movements of the tracer.

Optical gaging, normally restricted to direct projection of part outlines or surface reflections, can now be widely applied for difficult compound gaging. An OGP Coordinate Tracer, developed by Optical Gaging Products Inc., Rochester, N. Y., makes possible the checking of internal and otherwise hidden surfaces and contours.

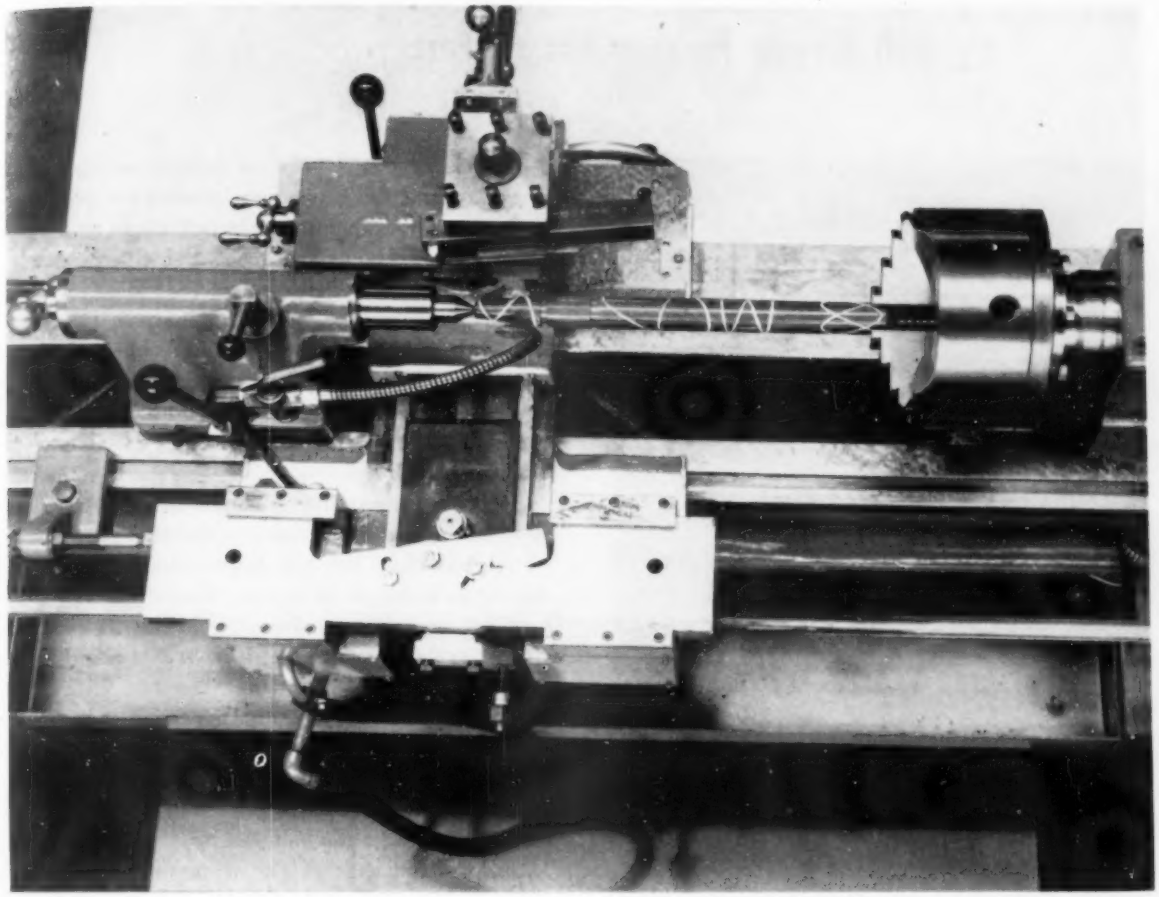
The tracing arm, which may be tipped with a carbide ball of any size, accurately traces any contour with a radius larger than its tip, and transfers the motion to an equivalent shape in the light beam. Motion of the magnified shadow of the shape in the light beam is checked against scribed lines of the chart.

EXAMPLES OF CONTOURS that would be impossible or difficult to gage by other means. Screw machine parts with internal blind contours can be explored and gaged, and concentricity of the internal bores with outside diameters can be verified simultaneously. Entire contours of cams can be checked instead of just 100 design ordinates. Since the flow of fluid through a nozzle is controlled by the size, shape and surface of the internal contours, all critical aspects can be gaged with the tracer method. Ball nuts, having critical internal radii that are difficult to gage by any means, can easily be gaged with the new tracer attachment.



Oil Grooving Machine Cuts Variety of Grooves

large lot production, this machine can be used to cut internal or external grooves; parallel or taper work; multiple-start, straight or spiral grooves; eccentric face grooves, and keyways and splines. It was designed and is built by Trojan Ltd., Croydon.

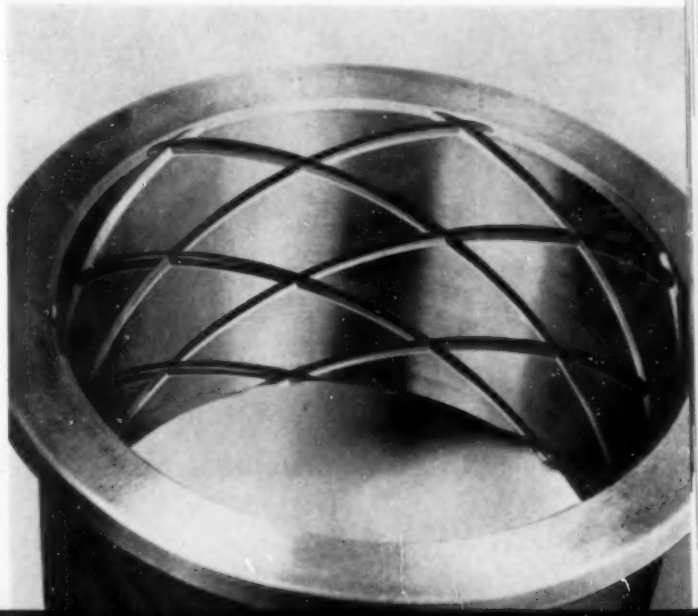


OIL GROOVING MACHINE can cut grooves with lengths up to 7 inches in standard figure eight shapes having 0, 1, 2 or 3 crossings. The chuck can be used for holding internal or external work. Multiple grooves of any number of equal spacings and any helix angle can be generated in a continuous cut without spindle indexing by mounting correct slip change gears. Generation is achieved by variable gearing that enables the tool to oscillate the correct number of times per workpiece revolution.

Surrey and is distributed by The Selson Machine Tool Co. Ltd., London, England.

The headstock spindle is motor driven by a V-belt and worm gearing and can be indexed to any divisor of 24 by disengaging a hand-operated dog clutch. It is coupled to a motion crank through change gears that enable any number of oil grooves to be generated in a continuous cut. The circular crank motion is changed into reciprocating motion through the crosshead where the saddle stroke length can be adjusted. A cam under the saddle relieves the tool on either forward or backward stroke depending on whether right or left-hand grooves are being cut. Special cams can be fitted to cut eccentric face grooves and a tailstock can be used for long external shaft cuts.

PHOSPHOR BRONZE BUSHINGS, 6 inches OD and 3½ inches long, have 6 right and 6 left-hand helical oil grooves cut in about 2 minutes. Right and left-hand grooves meet at the end of the bore with the flange.

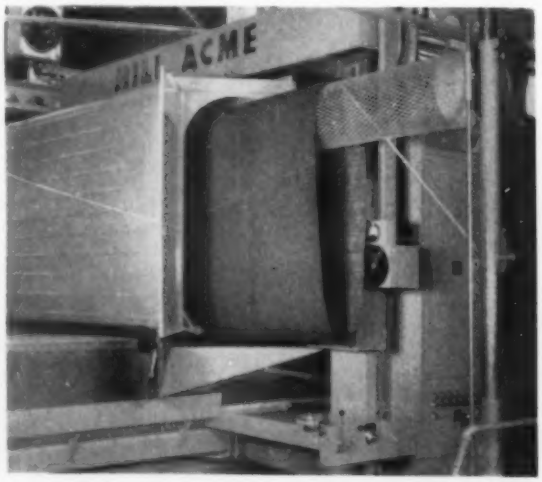


Belt Grinder Finishes Aircraft Parts

ABRASIVE BELT GRINDING and polishing machine includes all the accessories required for operation. Aluminum sections are placed on a full-coverage vacuum chuck that includes a special gasket that conforms to the shape of the part. A standard set of rectangular sections (illustrated) is also used. Safety stops are provided so material can never slide off the chuck. A vacuum switch, interconnected with the main drive, stops the belt and raises the grinding head should the holding power of the chuck be reduced below a safe limit.

ABRASIVE BELTS are easily changed. Coolant keeps the workpiece temperature below upper limits and prevents the belt from loading. Because of the air turbulence caused by the rapidly moving belt, coolant is directed at the point of contact through high-pressure nozzles. Additional jets in the coolant return troughs move the sludge to the filter. The filtered sludge can be salvaged and remelted.

The belt mounts on an upper steel idler roll and a lower neoprene-covered contact roll. Using the contact roll as the driver prevents slippage of the belt. The belt is fed into the work by a motor and accuracy of cut is within 0.00025 inch. The idler roll is positioned pneumatically to facilitate belt change and to maintain proper belt tension. Each roll has a pneumatic brake.

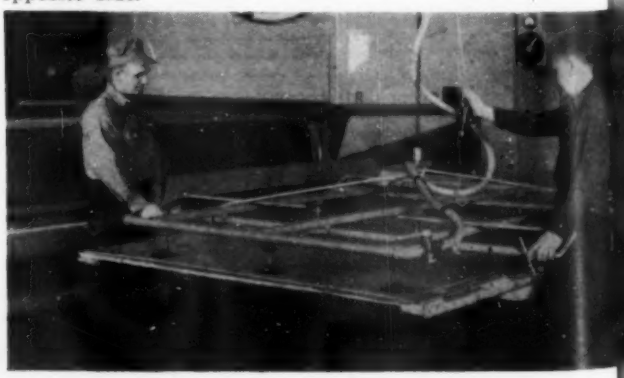


A new machine and a proven method have brought to the aircraft industry a new process for grinding flat and tapered aluminum aircraft wings and fuselage skins quickly, inexpensively and with minimum capital investment. Using wide, endless factory-coated abrasive cloth belts, the equipment can be used for roughing and polishing. Abrasive belt grinding is said to require 50-percent less floor-to-floor time than conventional skin milling. Fine grit belts can produce surface finishes of about 10 microinches, rms.

Everything about the machine is big. Abrasive belts in this machine built by The Hill Acme Co., Cleveland, Ohio, are 138 inches long and have a maximum width of 86 inches. Main drive power is supplied by a 250-hp d-c motor. The 84-inch by 16-foot table is reciprocated by two opposed low-pressure hydraulic cylinders. The two hydraulic pumps are driven by a 20-hp motor. Bleeder lines for the hydraulic cylinders maintain uniform table motion over a wide speed range. The entire width and length of the part is processed each time the table passes under the belt.

Uniform diameter of the neoprene-covered contact roll is necessary for proper operation of the machine. A pneumatic roll dresser is standard equipment and can be used without demounting the roll. Should it be necessary to remove the roll, this can be done easily because it is mounted on a tapered quill.

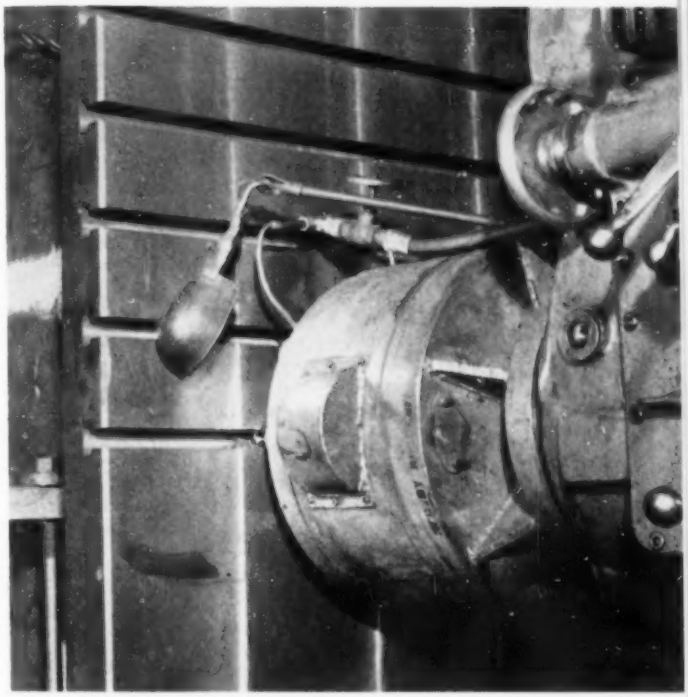
AUXILIARY EQUIPMENT includes an overhead crane extending across the loading and unloading area. It carries a small hoist with a vacuum pick-up mechanism. A mechanical holding mechanism is provided as a safety feature to complement the vacuum cups. The bridge rail is long enough so the hoist can pick up raw sheets from a truck on one side of the machine and deliver finished parts to a truck on the opposite side.



Multiple Spindle Milling Head Does More Per Pass

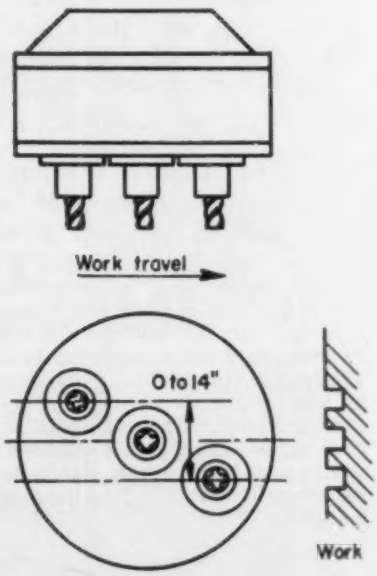
Designed to save production time by combining several operations in one pass, the Rock Milling Head can be used in several ways. When wide face milling with this head, for example, smaller, less expensive cutters can be used than would be required by a one-spindle head. Large keyways can be milled without grinding cutters to size because the head can be turned until the correct width is achieved.

In addition to the operations pictured, this unit, designed and built by Rockenfelder Industries, Strasburg, Ohio, can be used for deep slot milling cast iron and steel in less than half the time required to take the three cuts necessary in normal milling. The tops and sides of rectangular projections can be milled simultaneously by using a face mill and two edge-cutting slab mills.

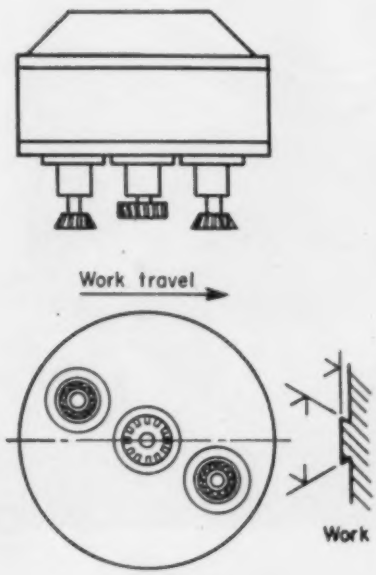


THREE-SPINDLE MILLING HEAD cuts complete T-slots in a cast iron slide for a hydraulic press in one pass. The lead cutter is $1\frac{5}{16}$ inch in diameter cutting to a depth of $\frac{7}{8}$ inch. The second cutter is $1\frac{1}{16}$ inches in diameter and cuts to a depth of $2\frac{1}{16}$ inches. The third tool is a standard T-slot cutter. With a spindle speed of 110 rpm and a feed of 2 inches per minute, a 54-inch slot is cut in 32 minutes, including the extra travel required to clear the third tool.

THREE KEYSLOTS can be milled in one pass with center distances between outside slots up to 14 inches. Different spacing is obtained by turning the head to alter the attitude with which the work meets it. Male dovetails can be surfaced on the top and both sides in one pass. A dovetail 3 feet long can be finished in 14½ minutes, including extra travel.



Multiple Keyslots



Dovetails

Thread Rolling MACHINE Features Through Feed

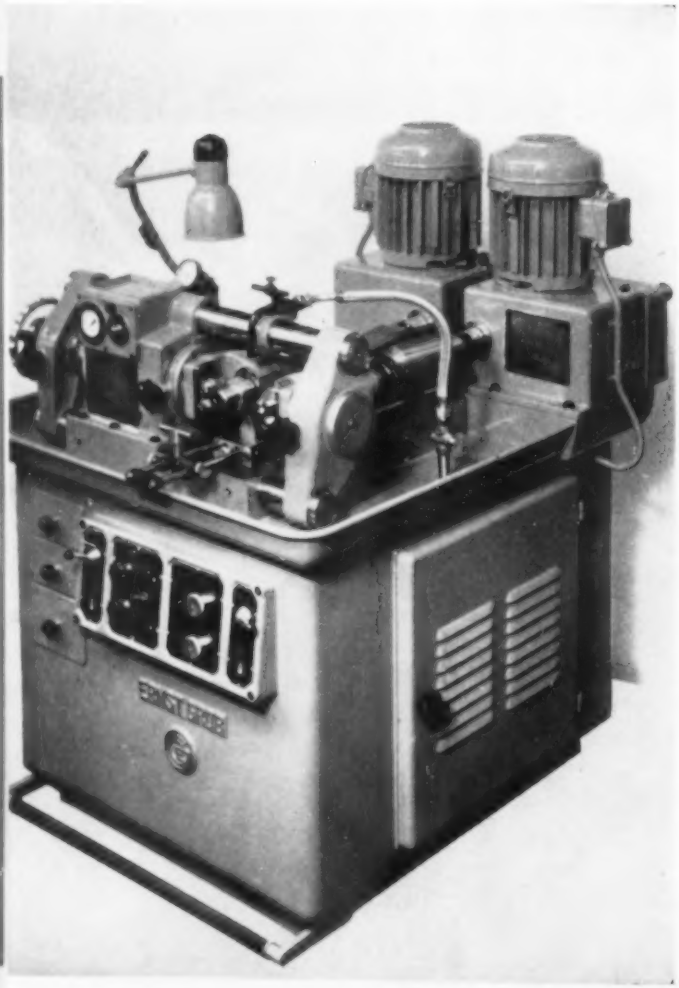
Truly universal in operation, the Model RM6d thread rolling machine can be used for conventional in-feed or for through-feed thread rolling. The rolled thread advantages of using blanks with diameters approximately equal to pitch diameter, good surface finish, high surface hardness and high strength exist with either feeding method.

For in-feeding, the ground roller threads have the same helix as the desired workpiece thread. During rolling, the workpiece rotates but has no axial movement so that threads can be rolled close to shoulders. Greatest accuracy is attained in thread form, pitch diameter and lead by the in-feed method. Micrometer threads, for example, are rolled in Europe by the in-feed method.

Main feature of this machine, built by Ernst Grob of Munich and handled by Ted Grob Co., Grafton, Wisc., is the manner in which the through-feed rolling is done. Instead of having a thread with a helix angle, the through-feeding rolls have straight grooves. The same roll dies can be used to roll any diameter thread having a certain pitch by adjusting the axes of the roll dies to the angle corresponding to the workpiece thread helix. The workpiece has an axial movement of one thread for each rotation.

With 32-pitch dies, for example, the following threads can be rolled: Any right or left-hand 32 thread with diameter between 0.100 and 2.000 inches; any double, triple or multiple thread having a helix angle not over 12 deg, up to 2 inches diameter with either right or left hand. In addition, the same dies can roll threads with pitches of 64 or 96. Threads can be rolled parallel or with a slight taper.

Advantages of through-feeding include: rolling of long threads, lower material costs and savings in time. Also, since the diameter of through-feed roll dies is unimportant, they can be reground repeatedly. Tooling for through-feeding is less extensive and less expensive.



STRONG FRAME and roller spindles supported by needle bearings in front and in back of rollers result in a rigid, accurate machine. Each roll is independently driven by a 3½-hp motor so load can be equalized. The length of thread can be automatically controlled by setting a limit switch. Rolling pressure, rolling time and speed of approach can be adjusted by controls on the front of the machine. When using the standard in-feed method, movement of the roller can be actuated manually, semiautomatically or automatically.

Inserts Broaden Uses of Plastic Dies

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and

A. J. Walker

Ren-ite Plastics, Inc.
Lansing, Michigan

Successful incorporation of hardened-steel inserts in plastic dies represents a significant advance in die making and one as inevitable as mechanization of production itself. This article, reporting collaboration of a plastics manufacturer and a die builder, shows how practical experience and technical knowledge have produced this important development. Many of the past difficulties encountered with plastic dies may be ascribed to the lack of such a well-rounded approach.

ONE OF THE MAJOR manufacturers of tooling plastics has long contended that reinforced plastic dies, in order to serve their purpose properly, should be designed and built by qualified die shops. Such a concept is basically sound since reinforced plastics are, fundamentally, just one more material from which dies may be fabricated; in order to function properly such dies must be built according to good die principles.

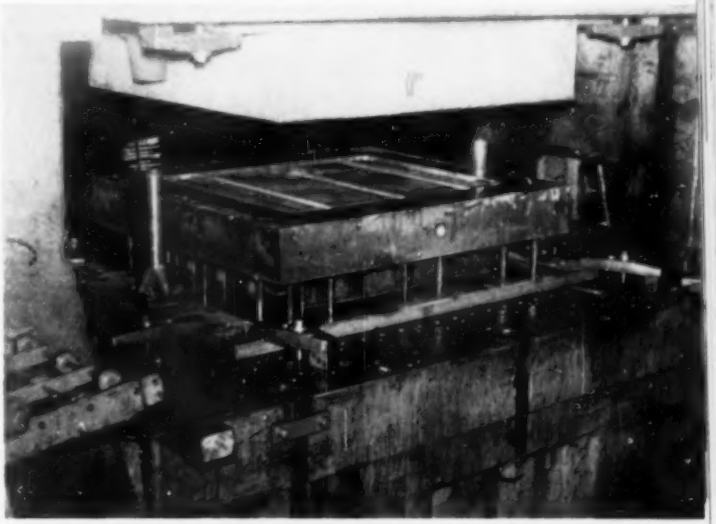
The general arguments in favor of plastic dies have been advanced many times previously, but plastic die applications have, for the most part, been developed by plastics companies, not by die construction shops. The merits of the newest composite (plastic and steel) have been touched on only briefly up until now.

Almost every die shop has found itself in the position of trying to satisfy a customer's need for an "impossible" delivery date at economical prices. These conditions invariably result in an unplanned, headlong plunge into the job of producing a "hard" die. A great many problems could be solved if both parties were to take the time to review the possibilities of incorporating reinforcements in plastic dies.

Using the principles outlined, reinforced plastic dies with proper steel inserts, *Fig.* 1, can no longer be considered temporary, prototype, stand-by, short-run, or any other term conveying such a connotation.

It has been found, in the face of considerable skepticism, that the combination of reinforced plastic dies and hardened tool steel inserts, *Fig.* 2, function most efficiently. Actually, the same principles of inserts have long been used with steel-and-cast-iron dies. If steel or cast iron requires protection against wear, plastic does also. The

Fig. 1. Plastic die and punch with steel inserts set up for production.

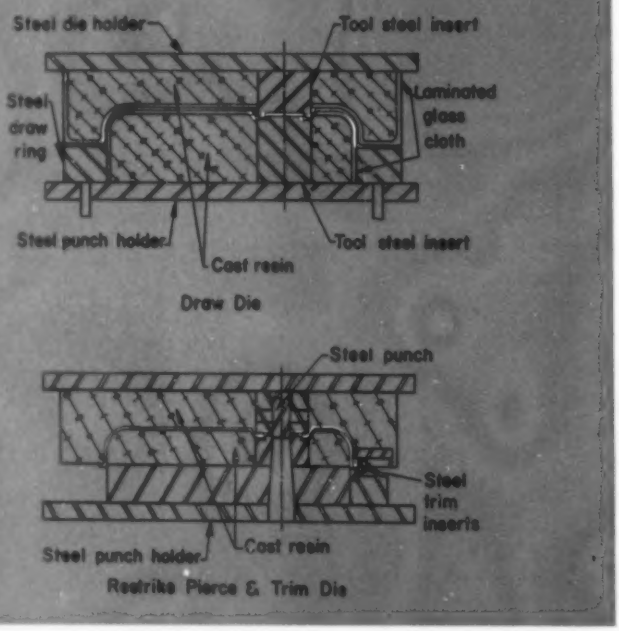


same design principles apply; only the method of construction varies.

Steps in Making Plastic Dies

A typical combination die recently went through the following stages, from processing through delivery: The product manufacturer received a contract for a low volume part. Obviously, die costs had to be held to an absolute minimum. By the time the contract for parts was let, only five weeks remained until the initial shipment date. The manufacturer's process engineer determined that the draw die and a combination trim and restrike die were required. Steel dies would have taken 10 weeks for delivery. In consultation with Ren ite Plastics, Inc., it was determined that the draw die was an appropriate plastic application, but there were some difficult problems to be resolved on the trim and restrike dies. Carr Industries was called in, the job was undertaken and a four-week delivery promised, since Carr felt that the problems could be satisfactorily solved by use of steel inserts on the draw die and a steel trim edge and inserts on the trim and restrike die, *Fig.* 2.

Fig. 2. Top, sketch of draw die set combining plastic base with hardened steel inserts. Bottom, restrike, pierce and trim die incorporating steel punch and steel trim inserts.



The first step in actual construction was to make a wood die model (a 3-day job). It was determined that it would be best to perform the draw operation so that the part would be drawn over the punch in the flat. It was further determined, after careful review, that the draw ring should be made of steel; the flat surface ruling out plastics, and pattern cost obviating cast iron.

Metal thickness was built up on the die model by use of sheet wax, *Fig.* 3; a frame was built around the model, and a parting compound was applied. A one-half-inch thick shell, using special epoxy die laminating plastics and glass cloth was then laminated, *Fig.* 4.

A steel piercing punch holder and steel mounting blocks were then placed in position and the cavity was filled with a special epoxy resin which can be cast to any desired die thickness, *Fig.* 5. Five more days were used for these steps. After the die half of the die had hardened, *Fig.* 6, it was pulled off the die model. The die was then waxed up for metal thickenss. The punch was then constructed in the same manner as the die; requiring four days elapsed time.

Fig. 3. (lower left) Waxing the die model to build up metal thickness.

Fig. 4. (lower right) Laying in glass cloth. Laminations are built up with epoxy plastic and glass cloth to ½-inch thickness before filling with epoxy casting plastic to a minimum thickness of four inches.

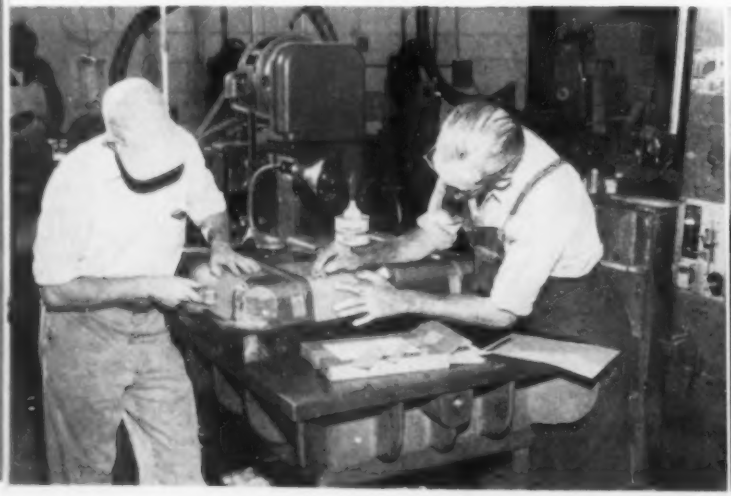


Fig. 5. Steel inserts being added during build up of die.

The draw ring had been machined while the punch and die halves were being constructed. Mounting holes were drilled and tapped in both halves and the set was then ready for conventional mounting. Two days elapsed time was required for this and the die was then ready for delivery.

The trim and restrike die set was made in exactly the same manner as the draw die except that steel trim edges were mounted in the die and punch.

Technical Considerations

Steel inserts should be specified at severe wear areas, as where inserts would be specified for hard die construction, substituting reinforced plastics for the other components. Otherwise, the basic draw or form principles are unchanged, thereby eliminating the need for specialized designers. Applications are limited only by the ingenuity of the tool engineers.

Reinforced plastic dies can be delivered in one quarter to one third the time required for hard dies. Due to the savings in Kellering, spotting, barbering and tryout times the dollar savings can range from 25 to 90 percent of the cost of hard dies. It should be noted, however, that the saving effected varies directly as the complexity of the contour.

Die buttons, punches and trim edges can be mounted in laminated plastic dies and engineering changes can be incorporated because of the basic nature of epoxies; adhesion. The laminates can be machined with standard carbide tools and sections can be built up, removed, or altered with relative ease. A variety of parts made with plastic dies incorporating inserts are shown in *Fig. 7*.

It is imperative that the group leader of a plastic die operation be a well qualified die maker. This is essential so draw developments and die inserts can be properly determined. No equipment other than that found in a good tool room, is required if the materials and methods described are used. Of course, the outlined procedure makes it evident that a good die model maker or source is required.

Hardened steel rails may be incorporated for a high-speed flanging operation. Dies made as specified will withstand a compressive load of 30,000

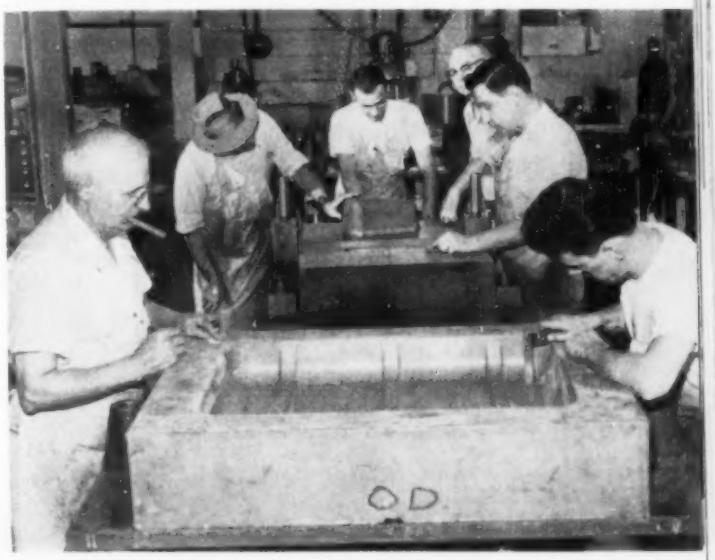


Fig. 6. Completed reinforced plastic die is checked dimensionally before being mounted for tryout.

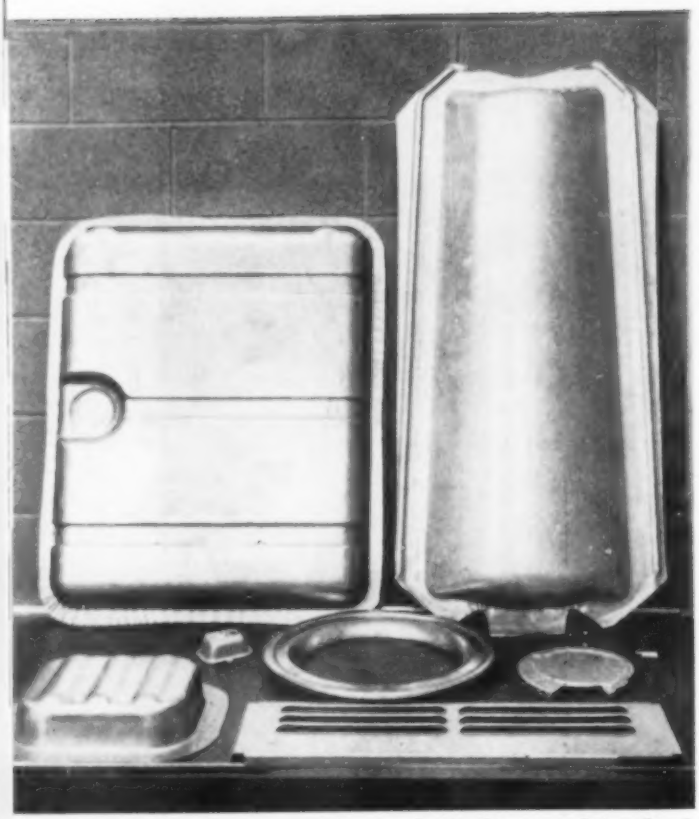


Fig. 7. Parts made on plastic dies containing hardened steel inserts. Louvers as well as pierced holes are produced on such dies.

psi. The dies, as constructed, weigh approximately 105 lb per cu ft as compared to 450 lb per cu ft for cast iron.

It should be kept in mind that reinforced plastic dies will not always be the most economical. Dies which are basically geometric in shape (straight, flat, round, etc.) would probably be more economical in steel. Dies which are composed of complex contours present the greatest possibilities for savings. This is explained by the fact that material costs for plastic die are equal to, if not a little higher than, steel and the same procedure must be followed whether the die is simple or complex.

Parts which must be scratch free are best produced on plastic dies since there will be no tool marks to produce scratches.

New plastic materials are constantly being developed for specific applications, thus helping to remove the stigma associated with plastic dies in the past. There are innumerable grades of plastic; the selection of the right plastic is as important as the specification of the correct steel for details of a hard die. In addition, most reputable tooling plastics companies will develop materials to meet a special need.

One of the later developments is the construction of a steel die and plastic punch. This opens an entire new area since it is the punch on which the plastics function most efficiently and the die or pad which suffers the most abuse. This is truly an undeveloped field and one which must and will be investigated thoroughly.

Model changes may be made oftener because of lowered tooling cost; thus leaving a smaller amount to be amortized over the production. This could furnish a company a real competitive advantage. The nature of a part often causes questions to arise, such as the number of draw dies required. Sometimes an expensive die which is not necessary is ordered. Also dies are sometime machined from mild steel or hardwood to try out the tool in the press to see whether the part will draw and to determine the number of tools needed before proceeding with the production tools; offering one of the most important advantages in using plastics. A die may be made quickly from the model in order to prove what tool is necessary. These same plastic dies can then be used in production; saving, in some cases, thousands of dollars and much precious time.

Conclusion

In conclusion, it should be remembered that no die will be any better than the materials or engineering principles used. Naturally, this is true whether the die be steel, cast iron, or plastic. Use of shrink-free tailored plastics and sound engineering principles, are resulting in serviceable dies. Experience shows, however, that every die job must be reviewed carefully before the ultimate decision is made as to whether the die shall be plastic, steel or plastic and steel.

evaluation of FLOATING TOOLHOLDERS

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EXACT ALIGNMENT between a machine spindle and a workpiece hole is a desirable but economically infeasible condition in tapping and reaming operations. It is easier to build "float" into either the machine spindle or the toolholder to achieve alignment between the hole and the tool. Many floating toolholders are available commercially, *Fig.* 1, and this article will evaluate the designs on which they are based with respect to function and service life.

Misalignment can be introduced by normal or abnormal wear, index error, manufacturing tolerances and expansion or contraction of machines and fixtures due to temperature changes. A floating toolholder can compensate for misalignment, regardless of its cause, so that the tool is guided by the hole in which it is working.

Sliding Coupling Holder: The Oldham coupling drive, *Fig.* 2, long used in floating holders, has two limitations: (1) forces required for alignment vary and (2) its efficiency is adversely affected by friction and attendant "dead zones." The shank of the coupling is fixed in relation to the spindle centerline, the coupling unit can move only in direction *D-D'* and the collet can only move in the direction *E-E'*—or at right angles to the coupling movement.

By studying the forces created in the tool by the workpiece the action and limitations of the floating toolholder can be seen, *Fig.* 3. As shown in Sketch 1, misalignment is compensated for by a series of infinitely small movements of the collet and the coupling. If the force exerted by the workpiece on the tool is designated as F, Sketch 2, it must be resolved into two components that will correspond to the reactions on the coupling ($F \cos \alpha$) and the collet ($F \sin \alpha$). If angle $\alpha = 45$ deg, the reactions are equal with values of $0.707F$. If the centerline of the work is on one axis, Sketch 3, only a force to compensate for misalignment between the coupling and the driver is required. If the centerline of the work is at a small angle to one of the axes, Sketch 4, the force components are of much different magnitude.

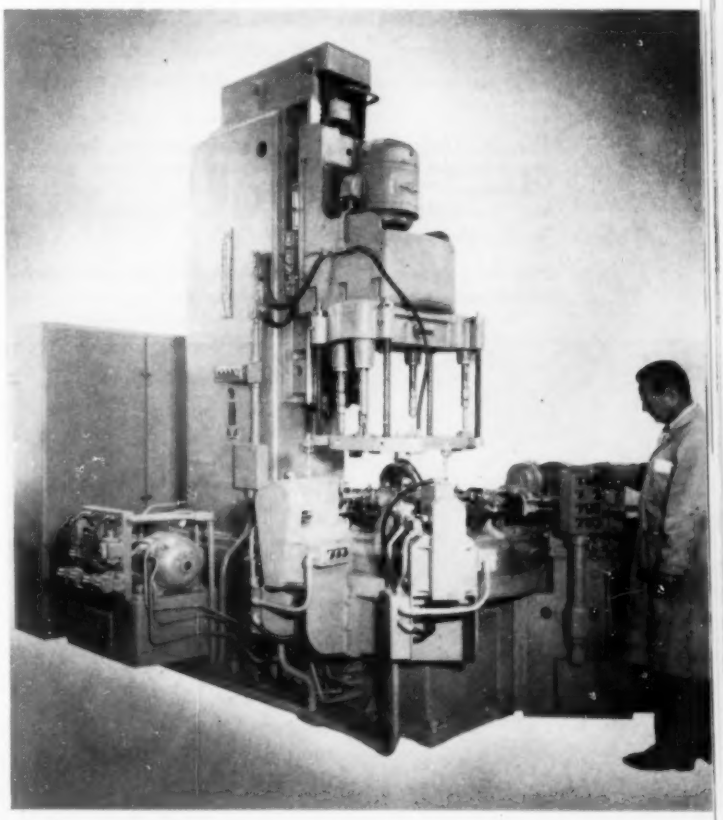


Fig. 1. Unrestricted float of the toolholders helps in the production of straight, round holes and fine finishes when reaming oil pump covers on this eight-station Barnesdril machine.

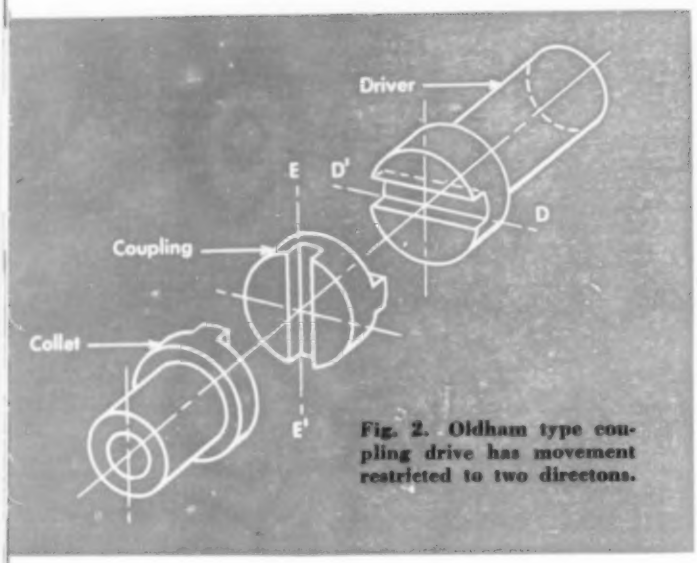


Fig. 2. Oldham type coupling drive has movement restricted to two directons.

If $\alpha = 10$ deg, for example, the components would be $0.174F$ and $0.985F$. It is thus seen that with the Oldham coupling aligning or effective forces are not uniform in all directions.

Considering the static coefficient of friction of steel on steel as 0.15, it can be seen that any force under $0.15F$ has little or no effect on the coupling. The arc sine 0.15 is approximately 8.5 deg. Where the angle of the centerline of the work to one of the axes is less than 8.5 deg, the force applied by the workpiece on the tool will not overcome friction in the coupling. This results in dead zones, or zones of no response, about the axes, Sketch 5.

The existence of dead spots is particularly noticeable in operations where the toolholder is stationary. When the holder is revolving, the directions of permissible movement are constantly changing and pass across the dead zones. This can lead to chatter and inaccurate workpieces.

Toolholders with Bearings: Some floating holders, while retaining the Oldham principle, use ball or roller bearings to improve their efficiency. The continued efficiency of these holders is entirely dependent on the amount of wear. Considering the coefficient of rolling friction of a ball as 0.001, which represents an angle of approximately 4 minutes, and of a roller as 0.002 to 0.005, the effects of friction or dead spots can be neglected. With roller bearings, the journal friction between the roller and the mounting pin must be considered. This may range from 0.002 to 0.050, depending on lubrication, velocity and load. Even this friction can be considered negligible for most metalworking operations.

Consideration of rolling friction is not the only basis on which ball and roller bearing holders should be evaluated. Actually, the bearings have a small reciprocating or rocking motion instead of a free roll. Investigation has shown that small reciprocating motions in bearings cause surfaces to fail rapidly because the scrubbing action between

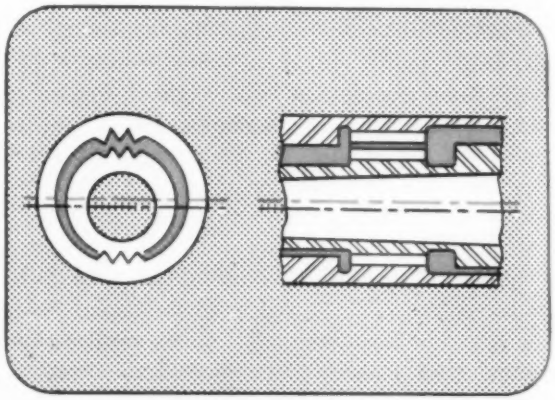
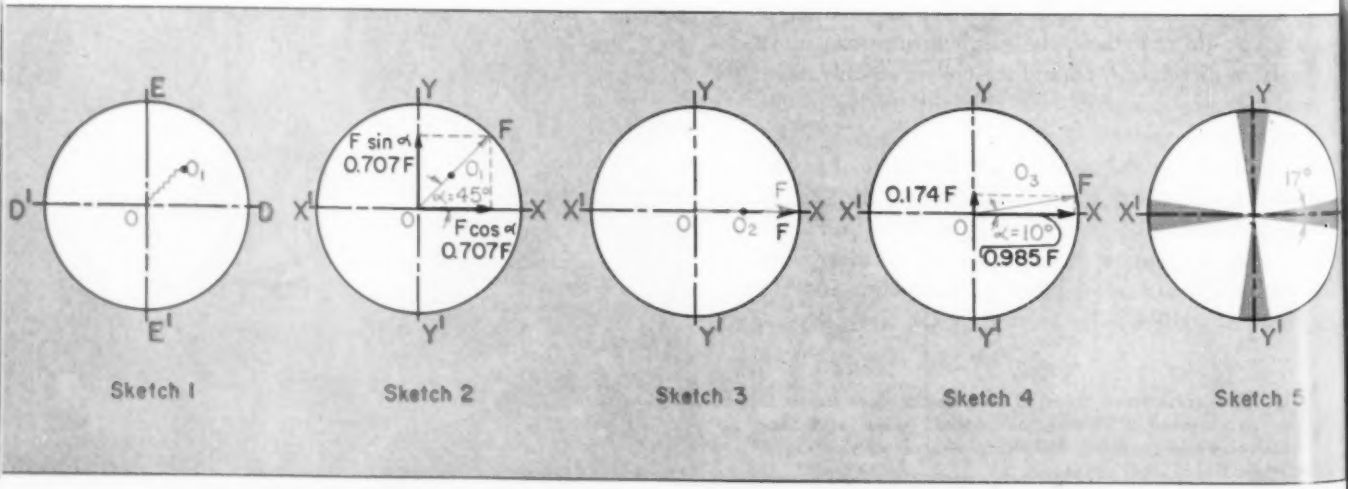


Fig. 3. (below) Effects of compensating forces on the Oldham drive under varying conditions of misalignment. The centerline of the machine spindle is represented by O, the centerline of the hole is shown by O with a subscript.

Fig. 4. (right) Elements of a single-gear spline drive which can cause whip when in action.



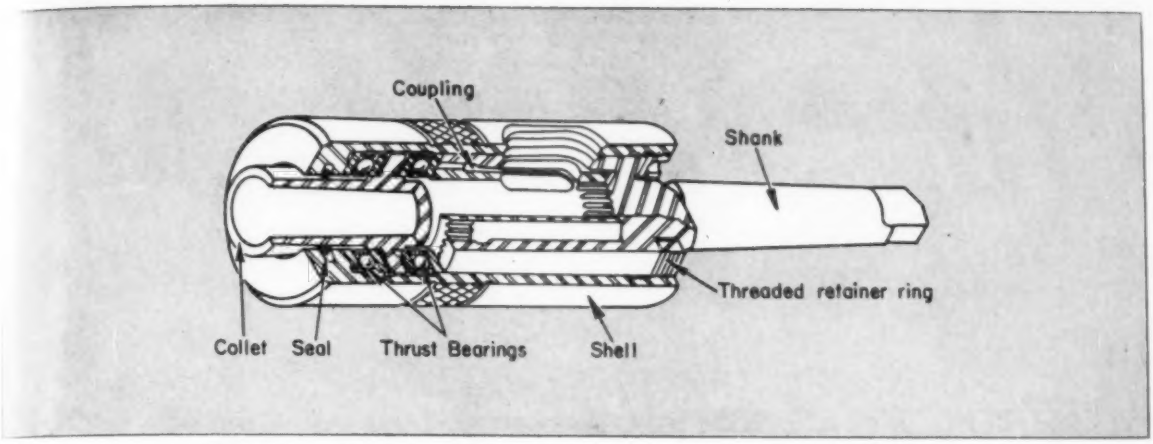


Fig. 5. A double-gear spline holder has a neutralizing intermediate drive member. Thrust bearings are free to roll with normal bearing action.

the surfaces destroys the lubrication film. Ball or roller bearing toolholders are seriously affected by wear in normal operation and premature bearing failure can be expected. Shock or overloads can cause permanent distortion of the drive members.

After short periods of operation, seats can be worn by balls or rollers that result in interference of metal. When this occurs, the holder is more ineffective than the sliding Oldham coupling type.

Unbalanced Drive Holders: This general classification includes the single-gear, *Fig.* 4, pin or ball, three-pin or other types of toolholders that do not have neutralizing intermediate drive members. They are characterized by a whip or crank action when the tool in the collet is moved off center. This action results in several adverse machining conditions. Undesirable stresses are set up in the machine spindle and bearings.

The whip action can also cause loads to be concentrated on one section of the driving element, which can cause tool breakage or failure of the holder. If a bending moment is induced in the tool, it cannot properly follow the hole in the workpiece and short tool life, and poor size and finish result.

Double-Gear Spline Holders: This type of toolholder avoids the disadvantages of the other types through use of a neutralizing intermediate drive member—a double-gear spline coupling, *Figs.* 5 and 6. In addition to having flexibility, strength and resistance to wear, this design has other advantages as a toolholder drive.

The clearance between the driving spline faces may be set at a predetermined ratio of the spindle misalignment. This permits building the proper clearance in the spline for the required misalignment in the holder. There is equal freedom of float in all directions. The constant changing of the spline teeth in contact distributes wear and provides positive lubrication.

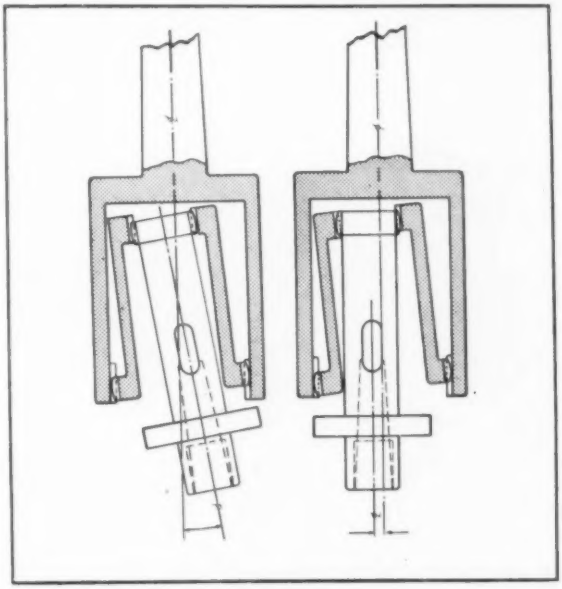
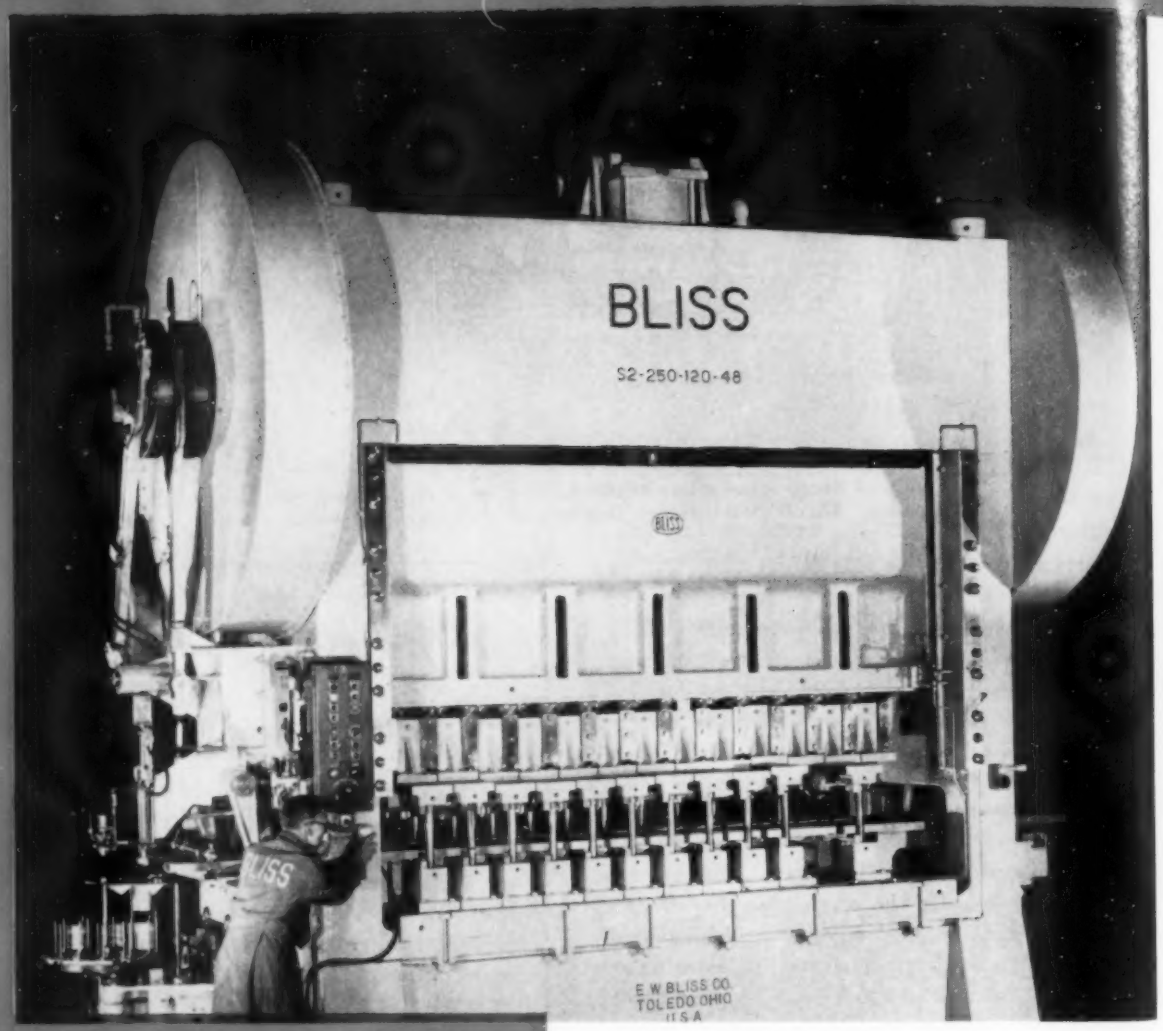


Fig. 6. Action of the intermediate member of the toolholder shown in *Fig.* 5. Angular float is shown at the left, parallel float at the right.

Characteristics of a Good Floating Toolholder
1. Balanced, constant-velocity flexible coupling
2. Freedom of lateral or angular movement
3. Uniform alignment forces
4. Efficient operation after normal wear
5. Resistance to shock or overload
6. Sufficient and efficient seals
7. Provision for centering pin

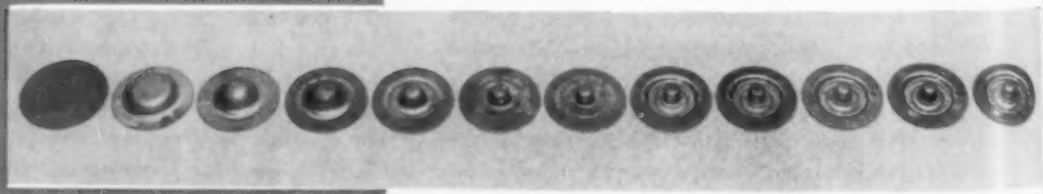
To overcome the small reciprocating movements of bearings in other types of holders, the drive of this type is separated from the floating element so the thrust bearing balls are free to roll. The shell of this toolholder is designed to act as a seal for the floating and driving elements. An O-ring, seated in the nose of the shell, keeps the lubricant in and chips out.



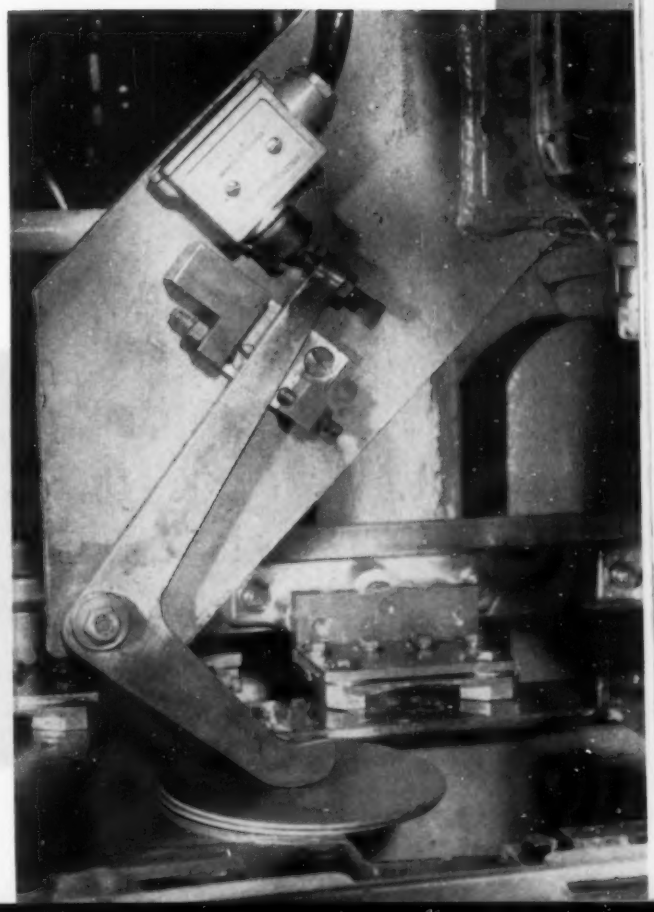
TOOLS at work

PRESS AUTOMATION is exemplified by this 250-ton transfer press recently installed in an automotive plant for production of electrical parts. By using 11 of the 13 available stations, a maximum of 28 starter brush end plates are produced per minute, in the steps described below.

The press puts a five-inch blank through six successive draws, flanges it, irons a ¾-inch cup, restrikes the flange, pierces ten tiny holes, lances four locating tabs and trims the part. Tolerance range is plus or minus 0.005 inch, with 0.0005 inch held on one surface. Feed is shown in detail, opposite.



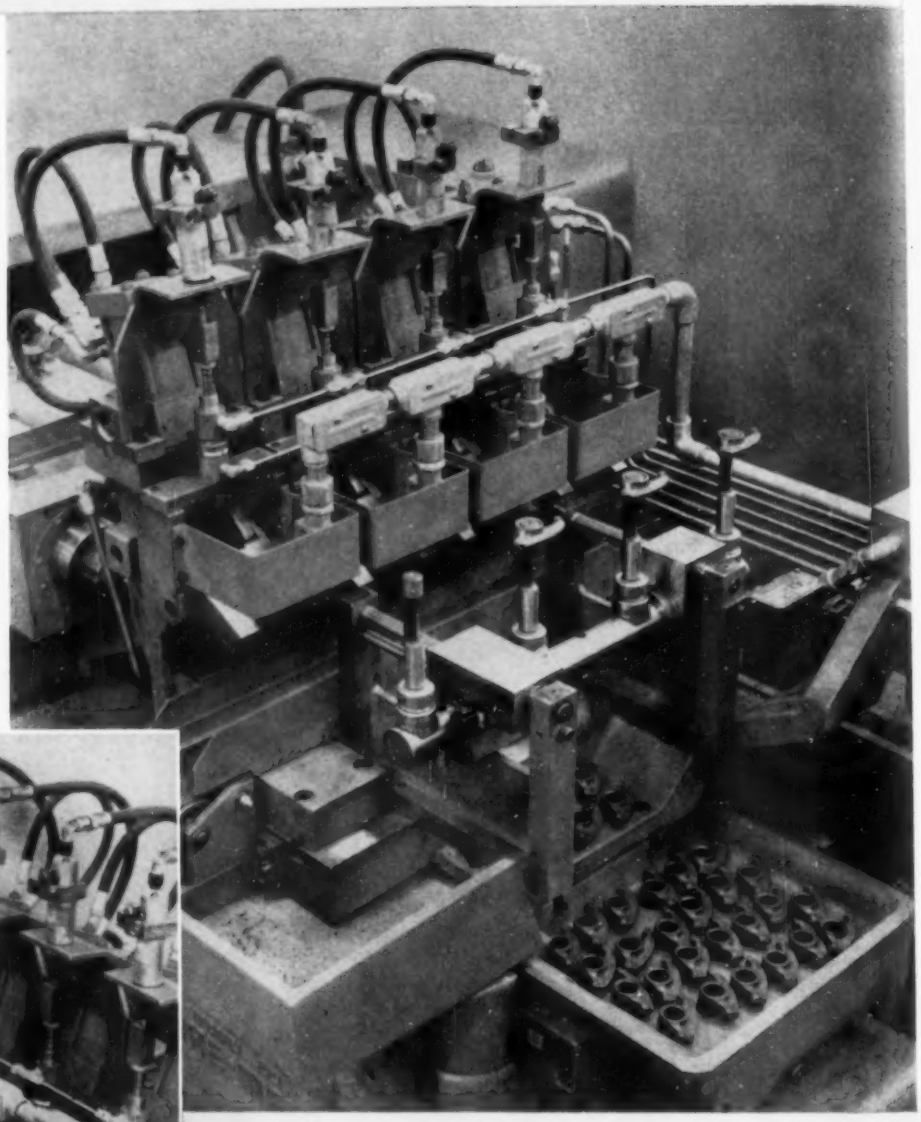
AUTOMATIC FEED MECHANISM has picked up one load of blanks from the six-station turret below. The vacuum cup plunger delivers the precut blank to the fingers. If the plunger fails to deliver the blank, a limit switch stops the press. As the supply of blanks is exhausted, a limit switch at the lower end of the plunger stroke is tripped and an elevator pushes a new stack into position. In descending, the elevator trips a switch, starting a motor which turns the turret to the next full station of blanks.

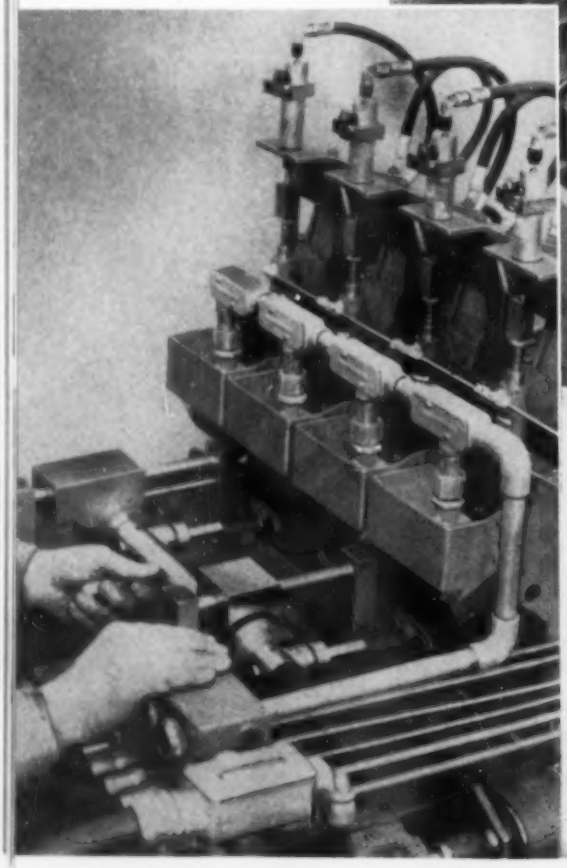


LAST OF FIVE safety sentinels of the press is this feeler and precision switch. If two blanks stick together and are fed into the press, they lift the feeler, closing the precision switch which actuates a solenoid opening a trap door in press bed. The blanks fall through and press operation continues uninterrupted.

—Photos courtesy E. W. Bliss Co.

TOOLS at work





AUTOMATION of boring operation is achieved with special fixtures and loading mechanisms mounted on a fixture sub-base on the machine table. The fixture design permits operator to load four stations while boring operations proceed on four previously loaded parts. Cycle is as follows: operator fixes rocker arm workpieces on the stake-type loading arms and swings arms up into fixture (Close-up). As the fixture clamp button is actuated an air hammer seats parts prior to clamping. Operator retracts loading stakes, contacting precision switch which starts machine table. After boring, the tools automatically retract; the table runs out at rapid traverse; work is automatically unclamped and ejected on conveyor.

—Photos courtesy Heald Machine Co.

Photocopy

smooths production flow

Fig. 1. Production orders can be duplicated in seconds by an operator with a photocopy unit. The machine combines functions of copying and automatic processing to give black-on-white copies directly.

PRODUCTION CONTROL is of vital importance for the thousands of component parts used in today's complex aircraft. To save time and increase accuracy in the vast amount of paperwork by which such control is achieved, North American Aviation, Inc., has reorganized the method of scheduling in their Los Angeles and Downey plants. Production control has been decentralized to fix responsibility in individual departments. In operation for one year, the new system has been thoroughly proved.

Heart of the system is a carefully controlled schedule and a simple method of conveying data on production status from department to department. Since inception of the new system, no delivery date has been missed.

One of the objectives of this new system has been the reduction of effort necessary to convey accurate status and schedule information from fabricating to assembly departments. It became evident early in the planning stages of this new method that a rapid method of duplicating or copying shop orders was needed in order to have an effective notification system without additional personnel. The former system required the use of shop follow-up personnel who generally transmitted information between manufacturing departments by word of mouth or hand-written memos.

The follow-up procedure has been changed from a "pull" to a "push" method. The responsibility for notification on such things as production delays, parts shortages and work order changes has been switched from departments downstream in the production flow to those upstream. Now, instead of a department running back to an earlier manufacturing department on a particular assembly to inquire, "where are my parts?", the responsibility is fixed so that the department upstream must notify the next department downstream of any delays that have occurred and why.

Key to this notification system in the manufacturing division is 23 photographic copying machines spotted in some 20 different departments. Furnished by American Photocopy Equipment Co., Chicago, Ill., these Auto-Stats are continuous copiers and automatic processing units combined in one compact unit, *Fig.* 1.

Housed in bright orange canopied booths so that they may be easily located in the plants, the photocopiers process various production and material record forms as they travel with the production flow. The forms contain all necessary information as to part or assembly, quantity, description, production status and authorized changes.

This method has reduced the number of stock chasers, follow-up men and trouble shooters with most of the functions of leg-work accomplished by the forms themselves. It has made expediting possible within a single department. Follow-up men traveled about eight miles in an average shift under the old system.

Photocopies are basically used for "Behind Schedule Notifications," Split Order Forms and Tooling Order Forms. Behind Schedule Notifications are copies of the shop order reproduced by the fabricating department and sent to the assembly department. The exact status of overdue parts is outlined on these forms. Because it is an exact copy of the work order prepared in the production plan-

ning department, the notification informs the assembly department of its position in the manufacturing cycle.

When it becomes expedient to move a partial quantity of parts ahead of the total quantity specified on the original manufacturing order, the shop order must be split. It has been estimated that nearly a million splits are made each year in North American production shops. Split order forms were previously prepared by hand and required an average of 3.4 man-minutes per split. Since it takes only about 40 sec to photocopy a split order card, much time and labor is saved with the new system.

The production planning department, where orders originate, translates engineering information into instructions for production departments. In addition to production orders, this department also prepares tool orders and cumulative production schedules for each item.

The basic flow of work within the department is

Fig. 2. Photocopy equipment is located in strategic places throughout the plants. This equipment, production planning and producing departments are linked by hourly messenger service.

from the project planning group, through the order preparation cycle to a schedule-control center, which routes copies of the orders to their proper destinations. Combined with tool orders and cumulative production schedules, this stream of production orders collects the necessary materials and tools, and authorizes the work performed by production departments.

Every production order is originally produced by ditto machine with a complete set consisting of the following copies:

Orchid card goes direct to the "open order" files where it remains until all parts have been completed and delivered to final control station on the routing.

Salmon card, as the "traveler" copy, accompanies parts or assemblies through routing to final stores where it is signed in. Upon delivery of parts to final stores, quantity of parts received is noted on the salmon copy which is then returned to the order sorting and distribution section of the planning department. It then replaces the orchid copy and remains on file as a record of completed delivery.

Green copy, as the "bench order," travels with the parts to the point of work in each station on the routing. It is used by the worker for his information and notations.

Yellow copy is the authority to draw material from warehousing. serves as direct material requisition copy, is forwarded by the control station to material control, then to warehousing where it authorizes issuance of material, then to cost accounting for cost accumulation against the contract or sales order.

White copy, as the material "traveler," accompanies the yellow copy, then is delivered with the material to the first control station at which material is used. In case of detail parts, the white copy is not included because the green copy takes its place in every respect.

Blue copy is the reference copy of the production order, shows order has been issued and goes to the using department. A number of these are dittoed for each new part and for each change. They provide advance information to assembly department of new parts to be received and tell how and by whom each item is made.

Information on these various preprinted production order forms includes: part number, index number, number of planes on the order, date issued, date released, description of part, department, contract and account number, quantity, operation or material used, tool type and number, speed, feed, and setup and unit time.

To make changes on green, salmon and orchid forms, a small portion of the upper right-hand corner of the routing card is blanked out and new information inserted, such as revised quantities or due dates. This is accomplished by attaching a self-sticking label about $\frac{1}{8}$ inch down from the top with the balance of label folded over to hold the tab in place while exposure is made in the photocopy machine. The replacement copies contain all vital information from the original ditto card except the blocked portion. Each copy is a positive with written notations clearly reproduced.

To speed routing of processed order forms, hourly messenger pick-up service is provided, *Fig.* 2. Many of the order chasers, expeditors and trouble shooters formerly required are replaced by a messenger girl equipped with a motor scooter. Changed forms can be quickly delivered to their destinations within the manufacturing departments, which results in a smooth flow of production.

Finishes for Metals

Organic Finishes and Their Properties

By Robert A. Wason
Associate Editor

A GOOD FINISH is formulated to meet the needs of the product on which it is applied. Also, a good finish must be compounded to meet conditions of application, ambient conditions where finish will be applied, amount of time that can be expended during application and the time schedule of events following application.

As there are different finish components to meet different conditions of end use, so are there different types of finishes. A quality product is usually protected and beautified by a system of finishes in which first coats prepare and smooth the metal surface, intermediate coats protect the metal and top coats add desired color and texture while protecting all preceding coats.

Primers and Undercoats: No matter how well the top coat is formulated, it can serve its purpose only if it can be bound to the undercoats. The main function of a primer is to adhere to the metal and provide "tooth" so that the succeeding coat will adhere to it. Flexibility, impact resistance, economy in use and ease of application must also be considered. A secondary function of a primer is in its hiding power. Opacity of primers, however, should not be built up to reduce the amount of top coat required because adhesion will be impaired.

For use under finishes compounded with volatile solvents as thinners, primers must be chosen that will not soften or lift. If metal surfaces have been chemically pretreated, the choice of primer is usually wider than if the primer is to be applied to bare metal. Since no single primer can possess all desirable qualities, selection of a primer is a compromise. A nitrocellulose lacquer primer loses adhesion at a scratch more than an alkyd but a phosphate treatment can minimize this difference.

Most primers contain corrosion inhibiting pigments such as zinc chromate, zinc oxide, red and blue leads, iron oxides and lead chromate. Vehicles are selected for their adhesive qualities, toughness, and resistance to water and chemicals. Oleoresinous vehicles are generally used in prime coats for automobiles, with synthetic resins added to modify the natural resins for quick drying and toughening the film. Primers for refrigerators and other appliances are generally compounded with white titanium dioxide and zinc oxide pigments. Alkyds, modified with a high percentage of urea or melamine formaldehyde resins, are used as vehicles. For added resistance to moisture, such as with washing machine components, alkyds are modified with phenol formaldehyde resins. Unpigmented phenolic base primers are also used on washing machine parts. A metal primer based on styrene copolymers has been developed for use under corrosion-resistant coats to improve adhesion and weathering.

If a baking primer is used, the baking schedule should be computed for the entire finish system before time and temperature of the primer bake are specified. Finish failures can often be traced to improper baking of the primer. Over-baking can result from bakes for subsequent coats and can produce a primer surface so hard that the intermediate coat will not adhere. Under-baking produces a soft film but can lead to lifting of the primer or its

absorption by succeeding coats. Either condition leads to loss of bonding. It is often possible to combine the baking steps for top and prime coats but the characteristics of all coats must be known before this is attempted.

High temperature baking (over 300 F) should be avoided when selecting a primer for use on heat treatable aluminum alloys such as 17S and 24S. Heating to these temperatures would cause metallurgical changes and result in lowered mechanical properties and less resistance to corrosion.

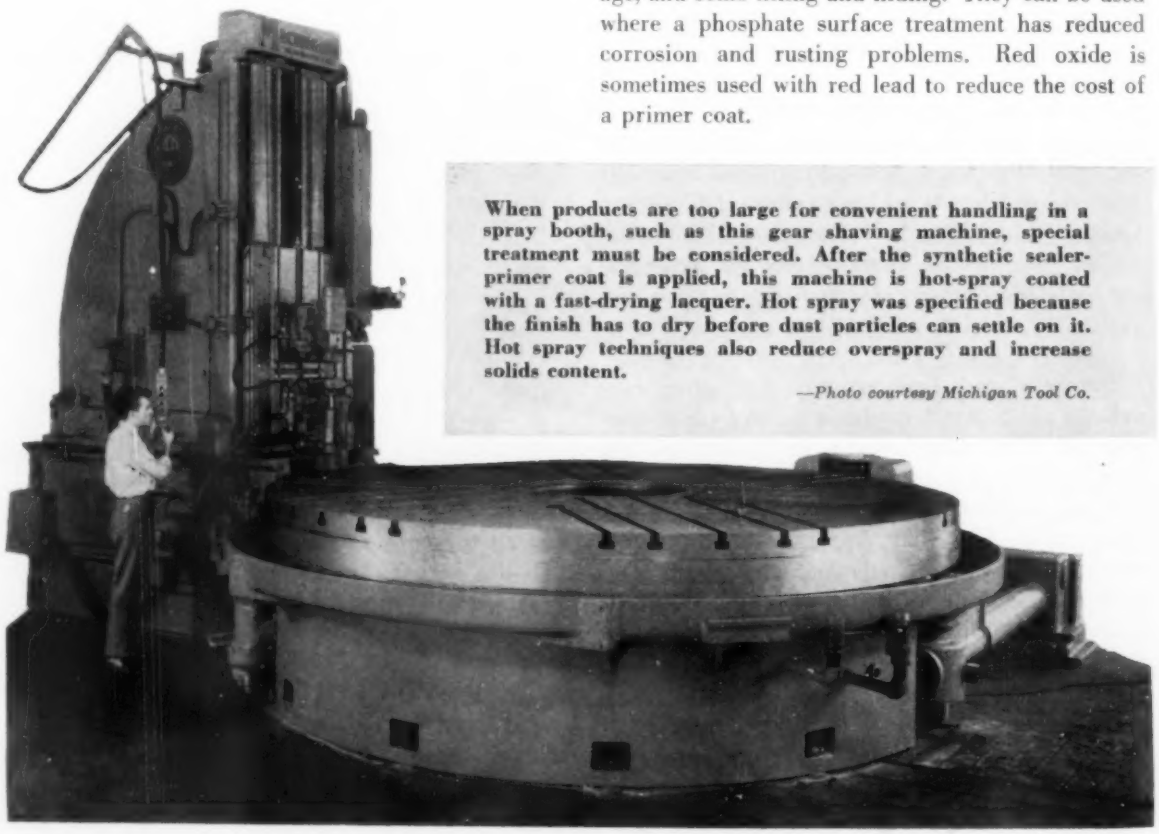
Red lead, when used with a linseed oil vehicle, provides good resistance to corrosion and is rust inhibiting. Linseed oil flows into the recesses and thoroughly wets the metal. Synthetic resins are used for vehicles when faster drying is required. However, surfaces must be cleaner for the synthetics than when linseed oil is the vehicle. A combination of synthetic resins and linseel oil is used when a drying time shorter than that of linseed oil alone is required. Red lead coater is a rust inhibitive protective primer for bare metal and is composed of red lead, reinforcing silicate, linseed oil and drier. Quick-drying red lead primer permits recoating in six hours under normal drying conditions. It has a long oil varnish type vehicle. Lead chromate is not equal to red lead as a rust inhibitor but has the advantage of not being a reactive pigment. Blue lead is used when lighter colored finish coats are desired.

Zinc chromate can be used with almost any type of vehicle, air-dry or bake. It has excellent resistance to salt spray. In presence of moisture, chromic acid is formed which passivates the metal. Used with red oxide, zinc chromate is a fast-drying rust-inhibitive primer for bare metal. It is used extensively on ferrous as well as nonferrous metals.

Zinc chromate primers are generally formulated with zinc chromate pigment added to a phenolic or alkyd resin base for use on aluminum. Such a primer air dries rapidly, being dry enough to handle in about five minutes. It can be recoated in about 30 minutes. Parts coated with such a primer should not be kept in storage long because progressive polymerization of the coating hardens it and reduces the adhesion of the next coat in the system when it is applied. Hiding power of zinc chromate primers is not as good as that for red lead. Used with a silicone vehicle, zinc chromate and iron oxide pigments form a good primer with corrosion resistance up to 650 F.

Zinc oxide is used under white enamels when the yellow color of zinc chromate would be objectionable. It cannot be used in as wide a range of vehicles as can zinc chromate since it is a more reactive pigment.

Red oxide primers give a fast dry, good coverage, and some filling and hiding. They can be used where a phosphate surface treatment has reduced corrosion and rusting problems. Red oxide is sometimes used with red lead to reduce the cost of a primer coat.



When products are too large for convenient handling in a spray booth, such as this gear shaving machine, special treatment must be considered. After the synthetic sealer-primer coat is applied, this machine is hot-spray coated with a fast-drying lacquer. Hot spray was specified because the finish has to dry before dust particles can settle on it. Hot spray techniques also reduce overspray and increase solids content.

—Photo courtesy Michigan Tool Co.

—Photo courtesy Cadillac Motor Car Div.

A quality product merits the best possible finishing system. After removal of drawing compounds and other surface soil, the components of this automobile are sprayed with a rust inhibitive phosphate coat. Several prime coats are applied, with each baked and sanded. Several top coats of lacquer are then applied, baked, sanded and polished.

A primer with zinc dust is the best for galvanized metal to insure adhesion. Such a primer contains pure color, linseed oil, a drier and powdered zinc metal stirred into the vehicle just prior to application. This type of primer is required on zinc because zinc reacts with the oil of oil paints and causes formation of soap substances that lead to blistering and loss of adhesion.

Special primers are required for some applications. Antitrust graphite paint is frequently used for exterior metal work. This durable, black finish is made from air-floated graphite, linseed oil, spar varnish and a drier. Another specialty primer is available for sealing tar-coated (bitumen) metal so color coats can be used. Usually two coats of the primer are required. Paint or plastic calking compounds should be used at interfaces between magnesium and other metals to prevent galvanic corrosion.

Magnesium must be given a chemical pretreatment prior to application of a primer. The primer can be zinc chromate in a tung oil phenolic resin varnish or in a polyvinyl butyral resin vehicle. Zinc chromate in the polyvinyl butyral resin vehicle is also used to prime cadmium—one of the hardest metals to coat. Because of its good corrosion resistance, a corrosion-inhibiting pigment is not required in primers for use on copper.

Aluminum can be coated with primers containing zinc chromate as the pigment. Other pigments used in prime coats for aluminum are: strontium and calcium chromate, and ammonium ferrous phosphate and iron oxide by themselves or with zinc chromate. Aluminum pigment can be used in the primer on low humidity aluminum applications. Lead-pigmented primers, such as red lead and lead sulphate, should not be used on aluminum because of the danger of galvanic corrosion.

White primers are used under all tints and bright yellows. A gray primer should be used under grays, blues, greens and dark colors. Pink primers can be used under bright reds.

For large iron and steel structures where phosphate coatings cannot be used, a wash primer gives good results. This inhibitive primer consists of polyvinyl butyral, zinc chromate and phosphoric acid. One disadvantage of the wash primer pretreatment is that it must be prepared for use each time by mixing the resin and acid components. Once mixed, the wash should be used within eight hours, even though no visible change occurs. The resin component has a hard settling pigment that must be thoroughly dispersed in the liquid and considerable trouble may be experienced during mixing.

Many primers have more than one pigment in their formulation. A typical multiple-pigment primer has red lead to resist moisture, zinc chromate for added resistance against corrosion, zinc oxide to aid drying and hardness and to help resist abrasion, and iron oxide to protect against sun and weather. This particular primer avoids weak spots that can occur with heavily-pigmented primers which leave valleys when brushed, or with synthetic types that are apt to dry so fast that they bridge over crevices and roughness without adequate wetting, penetration and adhesion.

In many finishing systems, a surfacing coat is applied over the primer to smooth over and level minor surface irregularities. By properly choosing the primer vehicle, both priming and surfacing

functions can be done in one coat. Filler or surfacer coats are frequently heavily-pigmented primers. They are usually used over the prime coat. They are easily sanded and neutral in color. Since they are porous, a sealing coat is used over the filler. Undercoats are usually similar to the top coat but with less pigment, giving additional opacity and protection.

—*Photo courtesy Kelvinator Div.*

With the exception of chromium plated and aluminum parts, the components of this refrigerator are finished with a baked synthetic enamel. Baking time is 30 minutes at 300 F. This finish was chosen because it successfully resists the various food acids with which it may come in contact and because it can be applied economically in mass production.

Typical Paints: Linseed oil paints have excellent service records for exterior exposure. They should be considered when the function of the finish is primarily decorative, where good resistance to expansion and contraction is important and where ample time can be permitted for drying. Because they dry by oxidation, usually a slow process, paints are seldom used in high production finishing.

Bituminous paints are usually formulated with a bituminous material such as asphalt, plus driers and drying oils in a suitable solvent. They can be pigmented if desired. These finishes are sometimes referred to as "japans." They can be applied to aluminum to protect it against highly corrosive atmosphere. They air-dry but some types require baking.

Metal paints usually contain basic pigments ground in linseed oil and should not contain sulfur compounds. White lead in a paint has a plasticizing effect that increases adhesion. White lead is stable and is not subject to flaking.

Aluminum pigments are widely used in protecting metal surfaces from corrosion, moisture and chemical fumes. Aluminum paint is made with aluminum powder in a base of linseed oil, varnish, gloss oil or synthetic lacquer. In fact, almost any resin can be used as the vehicle for an aluminum finish. Aluminum paint for exterior application usually has a spar varnish vehicle.

Aluminum paint can be applied directly to clean, bare surfaces, but if conditions are severe, it should be applied over a primer. Old galvanized surfaces can be coated with aluminum paint just as if they were ordinary metals. New galvanized surfaces must be chemically treated before applying aluminum paint.

Aluminum pigments are classed as leafing and nonleafing. The leafing type is primarily a flake form that overlaps or leafs during drying. Nonleafing pigments are either flake or granular. A pigment is either leafing or nonleafing depending on its process of manufacture and lubricants used during manufacture. Pigments can be used as pastes or powders.

For freedom from crocking (rub-off), a nonleafing pigment in paste form is best. Leafing pigments can be used with vehicles that will prevent leafing, but complete deleafing takes time. If insufficient time is allowed for deleafing, the surface will appear mottled. Vehicles with high polar compounds, such as alcohols, ketones and aldehydes, cause rapid deleafing. Elevated drying temperatures and vehicles with high wetting power speed deleafing.

Lead, zinc and calcium driers can cause deleafing. Cobalt is widely used as a drier where leafing effects are desired. Iron and manganese driers are also used. Highly polymerized vehicles are generally not used when leafing is desired. Special additives, however, can increase the leaf retention of alkyd and alkyd-melamine resin vehicles. Nitrocellulose lacquer is universally used in leafing aluminum paints, which dry to a metallic matte finish. Similar finishes can be achieved with epoxy, chlorinated rubber and acrylic vehicles.

Urea, alkyd-melamine and modified phenolic resin vehicles are used for baking aluminum finishes with either leafing or nonleafing effects. Polyester resin vehicles give bright leafing coatings. The coarser the aluminum particle, the brighter is the

nish that results. Where more than one coat of aluminum paint is to be applied, a complete second coat will be assured if the first is lightly tinted blue.

A special aluminum finishing material is made up of 85 percent by volume of pulverized aluminum powder in a special plastic vehicle. The material is applied by spraying and panels on which it has been sprayed can be bent to 45 deg without chipping, cracking or peeling. The aluminum leafs and heat transfer efficiency is excellent. The material can be used for sustained temperatures of 160 F and in intermittent service can resist 300 F.

High-temperature aluminum paints are formulated with silicone vehicles. When applied to clean, cool metal and heated to high temperatures, these paints fuse to the surface. The fusing temperature is about 400 F and the finishes can regularly be used up to 1000 F. Some formulations can be used to 1500 F.

The adhesion of silicone paints to steel is lower than that for a conventional oil-modified organic finish. If the metal surface is sand blasted, adhesion is greatly improved. Zinc dust formulations have been used with silicone resins and give good heat and corrosion resistance. At temperatures over 700 F (decomposition temperature of silicones), metallic pigments are required to insure a bond with the surface. Silicone paints with nonmetallic pigments are limited to use below the decomposition temperature.

Various colored finishes can be made with heat-stable inorganic pigments for use under 700 F. When silicone vehicles are modified with organic resins to lower the price, their use temperature should not exceed 500 F. Protection at temperatures higher than this is in direct proportion to the amount of silicone.

In order to improve coating characteristics and lower costs, the silicone structure has been modified by adding organic groups. These result in good heat resistance, lower thermoplasticity and good adhesion while making a bake unnecessary. Silicone-alkyd paints are better in the 400-700 F temperature range than are straight alkyd types. These finishes have low color fading and good resistance to chalking. Alkyd-melamine vehicles, for example, discolor badly at 500 F.

An entirely different class of paints can be used either as primers or top coats. Their major use is over iron and steel in highly corrosive atmospheres. They can be applied over tightly adherent rust or scale, penetrate through to sound metal and bond with as well as seal the surface. Some of these paints can be applied directly over damp surfaces and displace the moisture. Most of these paints contain zinc chromate but are available with a wide variety of additional pigments, resins and film formers for standard and special applications.

Varnishes: The usual varnish is formulated from resins plus a drying oil and driers in a suitable solvent. If the proportion of drying oil to resin is large, the finishes are termed long oil varnishes. For other uses, varnishes usually do not include pigments but for metal finishing they usually serve as a vehicle for a rust inhibiting pigment. The resin content of varnishes makes them tougher and less permeable to moisture than paints. Long oil varnishes require longer drying time and give softer films than short oil varnishes but are more flexible and tougher.

If a volatile solvent is used to hold the oil or resin in solution, the product is termed a spirit varnish. Mineral (petroleum) spirits, alcohol and turpentine are used. Shellac varnish is the most familiar of this group and consists of a simple alcohol solution of the natural lac resin.

There are many types of phenolic resin varnishes and they form hard, glossy films. They have a tendency to become brittle but if properly formulated they possess good adherence and high resistance to most chemicals except strong alkali and oxidizing agents. These films are thermosetting and usually receive a bake in the temperature range of 250 to 350 F. Quick-drying, waterproof and durable varnishes can be made with phenol resins and tung oil.

Business machines are exposed to hard use, perspiration and light conditions that can cause glare. A special wrinkle enamel is used in such applications. After parts are cleaned, one coat of enamel is electrostatically sprayed to a thickness of six to eight mils. After a 15-minute set up period, the coating is baked for 25 minutes in an indirect gas-fired oven at 325 F.

—Photo courtesy Burroughs Corp.

Enamels: A formulation comprising a resin plus a plasticizer in a suitable solvent is called an

enamel. Enamels are always pigmented. A varnish or lacquer base can be used for the vehicle in enamels. Enamels are available in all colors and shades. They generally have high gloss but semi-gloss, eggshell and flat finishes are possible with some types.

Their outstanding class characteristic is fine pigment dispersion. The gloss of an enamel bears a direct relation to the texture of the pigment. Enamels offer good abrasion resistance and can be formulated to resist attack of commonly encountered chemicals. They have good adhesion and can frequently be used without primers. Enamels build a full finish with fewer coats than are required for equal fullness with lacquer. Both types of finishes are being continuously improved and, for example,

—*Photo courtesy Burroughs Corp.*

A new hard dull enamel is being used on office machines because one thin coat is sufficient if the metal surface is properly prepared. Applied by electrostatic hot spray, wet coats from one to several mils in thickness can be achieved. After a 15-minute set up time, the finish is baked for 25 minutes at 400 F. The color is stable and can be varied to match by changing oven temperatures. Reflectometer gloss is controllable from six to ten percent and the finish does not polish in use. Its hardness and resistance to marring are better than for standard enamels.

currently share the automobile finishing market about equally.

Enamels dry more slowly than lacquers. For maximum toughness, baking enamels are used. These contain synthetic resin in a vehicle. Thermosetting enamels, once converted, do not soften with heat. Thermoplastic finishes are not transformed by heat and merely soften or liquify with each exposure.

Enamel coatings of the alkyd resin type are usually modified glyceryl phthalate plus a plasticizer in a hydrocarbon solvent. Such a finish has good adhesion, is durable and does not chalk on weathering. Time for drying can be reduced by baking at about 180 F. The alkyd enamels are more resistant to scouring and abrasion than linseed oil paints. However, for outdoor use, alkyd enamels are frequently modified with linseed or other drying oils to produce a finish with high resistance to weathering and changes in temperature. They can be formulated to air dry or to bake at about 260 F.

Melamine or urea formaldehyde modify enamels to shorten baking time. These modified finishes should be used, however, only when time and temperature can be closely controlled. Proper baking is important because these finishes do not form moisture resistant films by air drying. The modified phenolmelamine and alkyd-melamine enamels form tough, abrasion-resistant coatings. Quick-drying enamels are cellulose lacquers with pigments.

Urea and urea formaldehyde enamels are used where good abrasion and wear resistance are needed. Unless they are modified, they are not satisfactory for exterior use because they do not weather well. They are widely used on appliances where they are baked at about 250 F. Synthetic baking enamels for appliances are frequently formulated as medium to short oil glyceryl phthalate varnishes with urea, melamine or urea-melamine resins.

Japans are specially compounded baking enamels. A japan is always black. If colored, the same type of finish is just an ordinary oil enamel. A japan consists of pigment, gum, drying oils and a reducer. It is always baked to drive off the solvent and fuse the gum in a uniform layer. Japans give tough, durable finishes but because they require hand rubbing between coats they are being displaced by synthetic baking finishes.

Lacquers: These finishes air dry rapidly, depending on the particular solvent used, and there is no chemical change during drying. A dry lacquer film can be redissolved by contact with the solvent. They are usually formulated of nitrocellulose or cellulose acetate, although other synthetic resins can be used for higher resistance to chemicals. In addition to the resin, lacquers usually include one or more gums, a pigment, a softener and one or more volatile solvents. By the addition of a plasticizer, such a formula is actually a lacquer-enamel and has good adherence and toughness.

Clear lacquers have only limited use for protection, but pigmented lacquers are widely used. By modifying with alkyd resins and plasticizers, resistance to both corrosion and abrasion are improved. Lacquers are usually protected by clear

ats of wax for satisfactory outdoor service. Alkyd sin lacquers are among the most important finishes metal products.

Cellulose acetate lacquers are less flammable than trocellulose, fumes of which are toxic, and is used here fire hazard is high. Ethyl cellulose lacquers ave high dielectric strength, good heat stability nd flexibility at low temperature. Cellulose nitrate r acetate lacquers are resistant to water and gasoline but are not resistant to salt water, alcohol or il. They tend to discolor and become brittle on exposure to sunlight, although these properties can be improved by adding other resins to the finish.

When using lacquers as a metal finish, it is almost always necessary to use a good prime coat. Lacquers are generally harder and tougher than enamels but are not as flexible. Lacquers are also more expensive than enamels.

Hot lacquers have been developed to increase the solids content when spraying. Parallel with the development of lacquers for hot spraying has been the formulation of high-solids lacquers for application at room temperature. Ketones, because of low-boiling active solvency, are used in these room-temperature, high-solids lacquers.

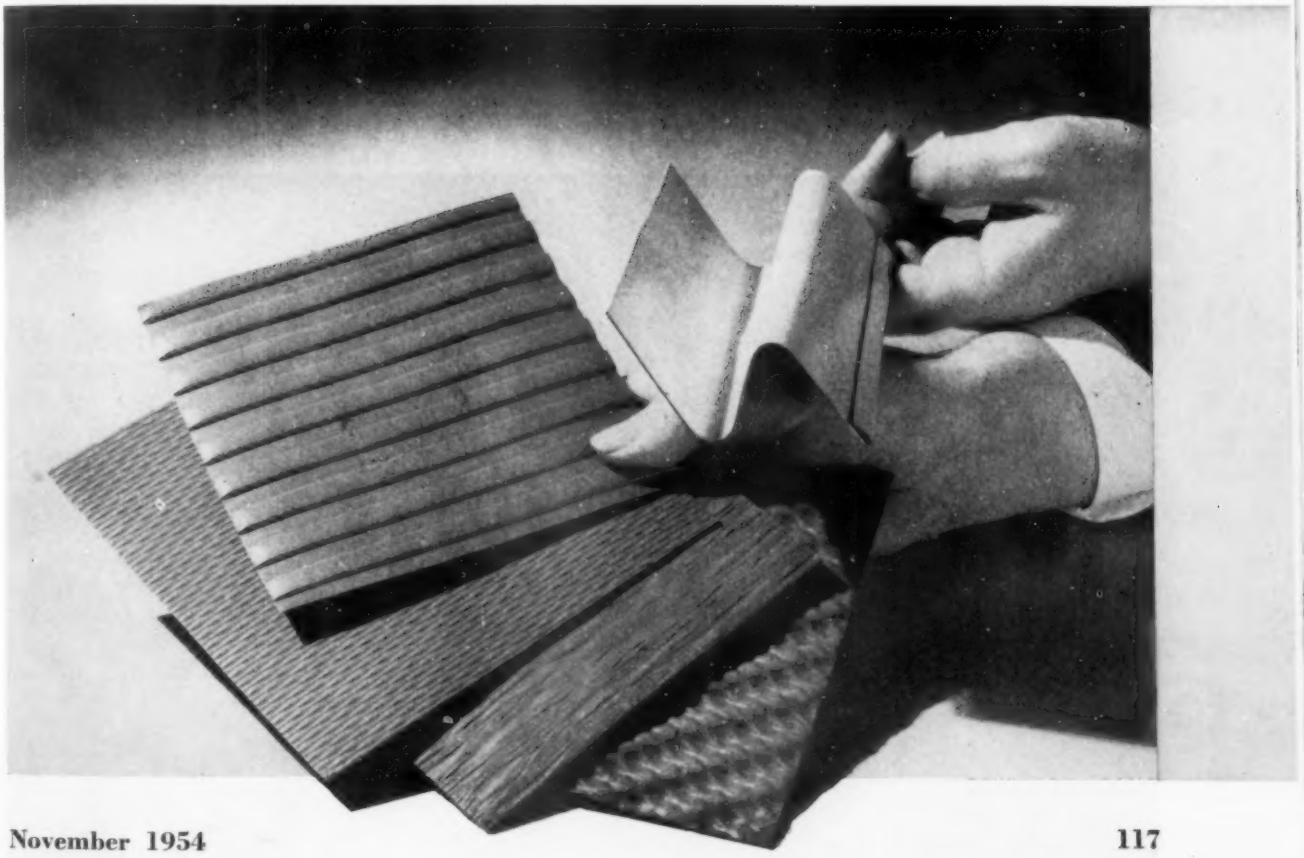
Special Finishes: Countless special effects can be obtained with lacquers and enamels that include special components and which are processed in different ways. Wrinkle and crackle finishes are produced by using an excess of driers. True wrinkle finishes must be baked but some air drying types are available. Wrinkle coatings are used to prevent monotony of a surface, cover slight surface defects and add durability.

Enamels can be given a crystalline effect by purposely introducing impurities during the baking step. These impurities are obtained by keeping the combustion gases inside the oven. Hammered effects are achieved by special formulations or overspraying a second coat while the first coat is still wet. Another special finish appears as a lustrous hammered finish on a smooth surface, or can be sprayed as a full wet coat and immediately given a light mist coat to give an opalescent effect on rough surfaces.

When special ingredients are added to some lacquers, they achieve a veiled appearance. Silicone finishes have not yet been developed that will wrinkle, but they can be applied to give a veiled effect for product identification or to hide minor surface irregularities on products that will be exposd to elevated temperatures.

Lithographic enamels are applied to metals by printing methods and then baked. Some of these

A finish is not always the last step. These vinyl-metal laminates were finished in the flat and then formed. All of the advantages of a vinyl finish are obtained with this finishing system in addition to formability. The bent and crimped specimen shows the extent of forming that can be done without damage to the coating. *—Photo courtesy U.S. Rubber Co.*



coatings are applied before the final form is imparted to the product. Wax, included as a component in the coating, rises to the surface to protect the finish by lubricating it during forming.

Special fire resistant finishes have been developed especially for marine applications. A typical finish prevents the spread of fire because it will not burn, support combustion, contribute to combustion, flash or flame. It does not drop glowing flakes or chips to spread fire. It has good abrasion resistance and can be washed. Exposed to high temperatures, it volatilizes to a fine ash.

Luminous paints use special pigments and must be applied over white prime coats. The luminous material gives better results if it is added to a special lacquer vehicle. Activity diminishes little in interior use but exterior life is about two years. A top coat of clear lacquer over the paint extends its life.

A special finish coat has been prepared in which a vinyl plastic is bonded to sheet metals with an adhesive. The finish is colorful, decorative and permanently rust and corrosion proof. It has higher abrasion resistance than ordinary varnishes, paints or baked enamels. Adhesion tests on this material indicate pressures in excess of 40 psi must be exerted to remove the vinyl from the metal. Another vinyl based special is pigmented with stainless steel to give a gray, metallic appearance with good resistance to corrosives.

Another specialty finish indicates the functions which various portions of a finishing system perform. The coating is used over a steel surface having a phosphate pretreatment. Zinc chromate combined with iron oxides in a suitable vehicle provides a first coat with flexibility and resistance to salts, acids and alkalis. The iron oxide reduces brittleness in the coating. If used alone, this coating would not be as effective as many standard finishing coats. The second coat is mica flakes in a vehicle of modified phenolic and alkyd resins to give resistance to heat, oxygen, salts, acids and alkalis. The third coat screens out ultraviolet light to protect the first two coats, enhances resistance of the other two coats to corrosive conditions and gives a pleasing appearance.

The next article in this series will describe the methods and equipment used during the finishing of metal products. Not only have finishes changed since the lone method of application was a paint brush, but dramatic methods of and equipment for application have been introduced and refined.

(To be concluded)

Acknowledgments

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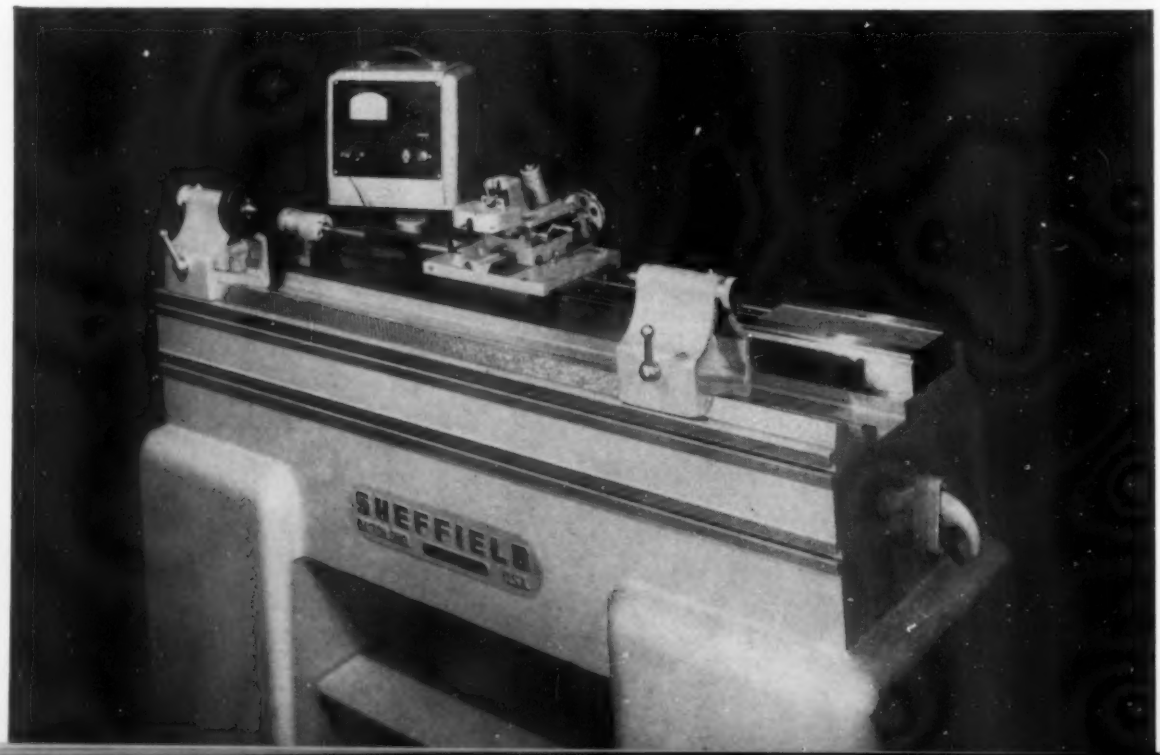
The Sherwin-Williams Co.....Cleveland, Ohio
U. S. Rubber Co.....New York, N. Y.
Westinghouse Electric Corp.....Pittsburgh, Pa.

A simple, rugged, clean machine design can be enhanced by a good finish. Not only does the finish protect the metal parts, but it can give the impression of quality and accuracy as with this thread checking machine. Also, a good finish can lead to improved cleanliness and result in extended equipment life.

—Photo courtesy The Sheffield Corp.



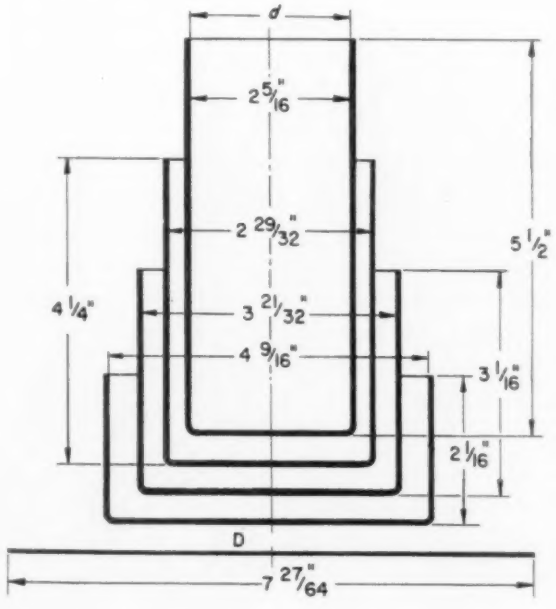
By Hjalmar Dahl

Mechanical Engineer
Upplands Vasby, Sweden

Multiple Draw Cylindrical Shells

THE CHART on the following page is presented to reduce the computation required when designing tooling for multiple draw cylindrical shells. The chart indicates: (1) blank diameter, (2) number of draws required, (3) punch diameters and (4) depth of each draw, when the final dimensions of the shell are known. It can replace all calculation or be used as a first approximation and check. The chart is substantially accurate for commonly used sheet metals up to $\frac{1}{16}$ inch thick and is based on diameter reductions of 40 percent for the first draw and 20 percent for each succeeding draw. The chart is designed for computation of tools for shells with small radii between the wall and bottom.

A typical multiple draw cylindrical shell is shown in the sketch on this page. It is for this shell that the tooling is shown in colored lines on the chart.



Aside from the dimensions of the finished cup, all dimensions were obtained from the chart.

From the point on the left scale equal to the internal shell (final punch) diameter, a horizontal line is drawn to the right. From the point on the upper scale equal to the final shell height, a curved line is followed down to the point of intersection with the first line. The location of this intersection indicates the number of standard draws required to produce the shell. If the point lies anywhere within a draw zone, the finished shell will ordinarily be produced with that many draws.

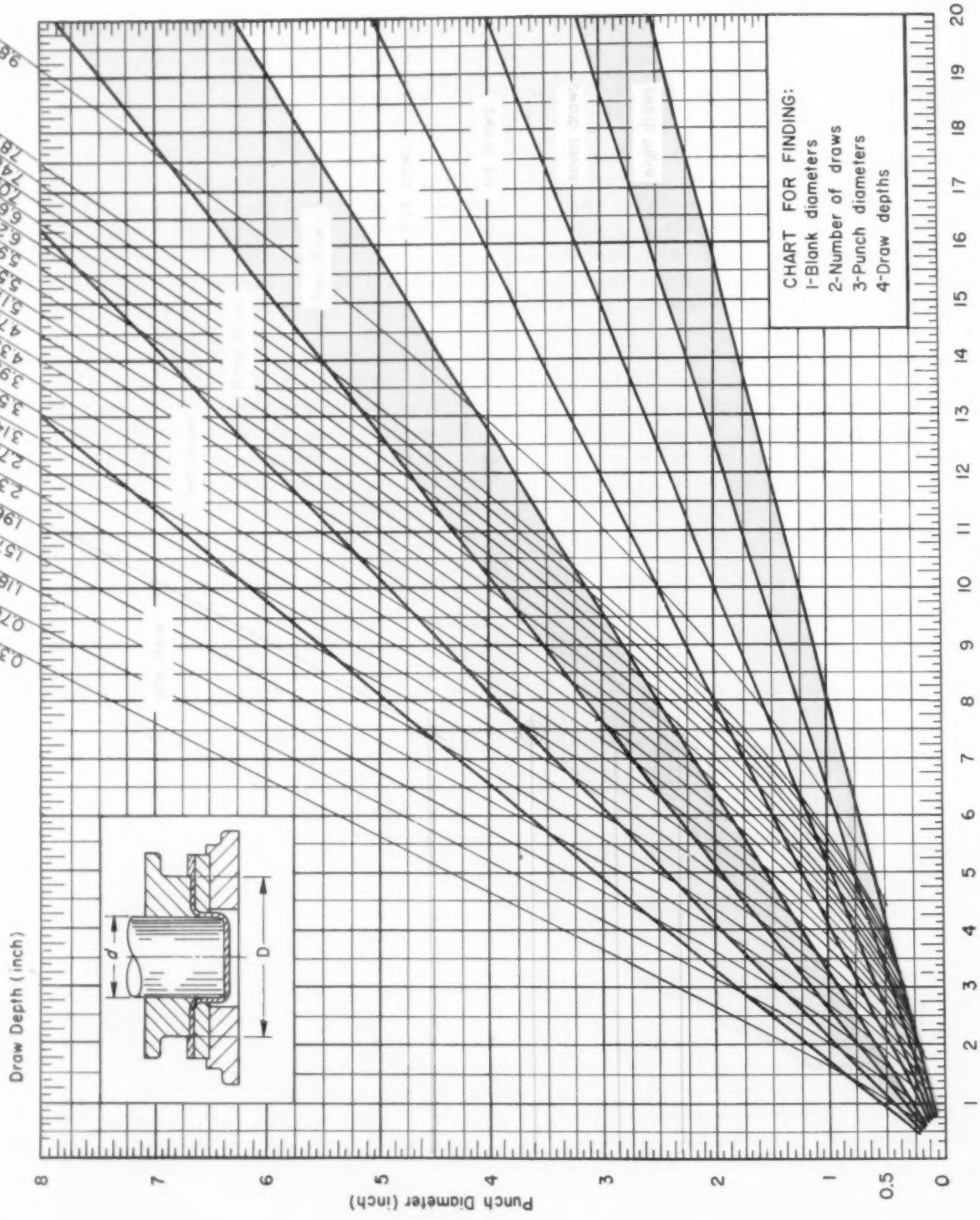
Directly below the intersecting point, the diameter of the required blank can be read on the bottom scale. A line extended vertically up from the intersecting point crosses all the draw zone boundaries. The points of intersection between the vertical line and the lower zone boundaries indicate the punch diameters (left scale) and the depths of draw (upper scale) for the various stages.

EXAMPLE: Determine the blank diameter, number of draws, depths of draw and punch diameters required to produce a cylindrical shell 5.5 inches deep and $2\frac{5}{16}$ inches in internal diameter.

SOLUTION: (Colored lines on chart.) From $2\frac{5}{16}$ on the left scale, construct a horizontal line to the right. From a point on the upper scale estimated to be 5.5 extend a curved line downward until it intersects the horizontal line. This intersection is enclosed in a single circle. Directly below this is read the blank diameter, $7\frac{27}{64}$ inches. Since the intersecting point is within Draw Zone 4, four draws will be required to produce the part.

Extend a vertical line upward to intersect with the lines marking the lower boundaries of Draw Zones 3, 2 and 1. Read punch diameters to the left of these intersections and draw depths by following curves upward from the intersections. The following values are obtained:

Draw (No.)	Punch Diam (inch)	Draw Depth (inch)
1	$4\frac{9}{16}$	$2\frac{1}{8}$
2	$3\frac{21}{32}$	$3\frac{1}{16}$
3	$2\frac{29}{32}$	$4\frac{1}{4}$
4	$2\frac{5}{16}$	$5\frac{1}{2}$



Draw stages from blank to finished shell, giving dimensions for each punch and draw stroke.

Draw stages from blank to finished shell, giving dimensions for each punch and draw stroke.

NEWS

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MEMBERS of ASTE who saw the September 27 issue of *Life* magazine may have noticed a familiar face in an article on education entitled "How to Keep Teacher." Describing the program set up in West Hartford, Conn., to cut down teacher turnover, the feature includes two candid photographs of Ray H. Morris, president of the Society in 1943-44 and now parliamentarian for the Board of Directors.

ALSO this year's president of the West Hartford Rotary Club, Mr. Morris was pictured at a picnic sponsored by the Chamber of Commerce before schools opened to greet the city's 109 new teachers. Theme for the event was "An apple for the teacher" and in keeping with the motto, he was shown offering the traditional apple to newcomer Carolyn Cederholm. Another photo showed him at a school luncheon where gifts of plants and ball-point pens were given out by Rotarians.

WITH the whole town pitching in to make the welcome successful, special attentions for new teachers also included a square dance and house hunting services. Schools aided by assigning veteran members of faculty to help the new instructors get started. All phases of the West Hartford plant to "keep teacher" could serve as a pattern for other towns for keeping enough teachers for their swelling enrollments.

ALONG a little different line of discussion about a different magazine, THE TOOL ENGINEER for next month will feature news articles on: nomination of candidates for the next election of members to the Board of Directors; the 1954 semiannual meeting of the Board; two on-campus conferences; and ASTE's new student chapters.

New Handbook

to Aid Die Designers

By Nancy M. Honston
News Editor

News that the *ASTE Die Design Handbook* is being readied for publication early next year has stimulated enthusiastic response from die designers and users. Mail arrives every day at ASTE headquarters asking about the new handbook, when it will be available, what it will cover and how the material will be presented. These same questions were asked hundreds of times of staff members manning the ASTE exhibits at this year's Industrial Exposition in Philadelphia.

Although the exact publication date has not yet been set, it is almost a certainty what copies of the book will be out in time for ASTE's Western Industrial Exposition in Los Angeles next March.

Compiled by the engineering editors who produced the authoritative *Tool Engineers Handbook*, material for the *Die Design Handbook* originated chiefly from actual experiences and operations of the manufacturing industries, scores of whom cooperated in supplying authentic engineering data and blueprints. The new volume will be published by McGraw-Hill Book Co., Inc., New York, N. Y.

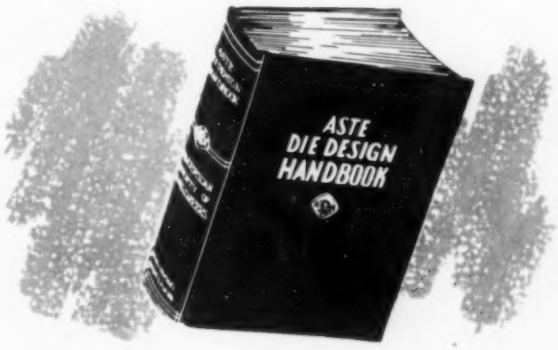
In scope, the book is specialized to cover tools and operations in the cold pressworking of sheet or strip metal. Its purpose is to make available the essential design details of dies that have proved successful in scores of company pressworking operations. The *Die Design Handbook* is for the man who already knows how to design dies, but is having a particular design problem and would like to know how someone else has solved a similar difficulty.

Before work was begun on the handbook, every ASTE member and hundreds of others were asked what information would be most valuable in such a book. Results of this survey served as the guide in planning the contents.

Hundreds of drawings, graphs, formulas, and charts were assembled and classified at ASTE headquarters. All information and data were evaluated by engineers in representative metalworking industries before writing began. Initial manuscripts were reviewed by another group of authorities and final manuscripts were not completed until material received at least five different reviews.

Sectional sequencing of the handbook follows the typical flow of decisions, designs and operations that actually occur in die design and utilization. Design of the stampings to be produced is the first consideration, followed by: the principles of process planning that lead to die design decisions; theory of metal movement applicable to each of the various classes of dies; actual, classified die designs; die setting principles; and selection of presses.

For quick reference, general topics have been split into individual sections as far as possible.



Instead of grouping all metallurgical theory together, for example, the theory of shear in metalcutting is a separate section, immediately followed by a section covering many practical designs of cutting dies. This enables the reader to concentrate upon the problem at hand.

Illustrations are plentiful. With more than half of its pages devoted to drawings and diagrams, the *Die Design Handbook* might well be called the visual guide to better design.

ASTE HONOR AWARDS ANNOUNCED

Society to Present Four Gold Medals in 1955 for Outstanding Achievements in Tool Engineering

Recipients of ASTE's honor awards for this year will be selected by members of the Honor Awards Committee. Pictured below, from left, are: Frank W. Curtis, vice chairman; Ray H. Morris; Frank A. Shuler; Frank Wilson, ASTE technical director; T. Bert Carpenter, chairman; Harry E. Conrad, ASTE executive secretary; Douglas D. Burnside; William H. Smila; Otto W. Winter; and Walter F. Wagner.

Four gold medals to honor outstanding contributions in the field of tool engineering have been announced by the ASTE Honor Awards Committee. These medals will be presented annually to promote the art and science of tool engineering and to encourage contributions in the immediate and in related fields covered by the activities of the So-

ty. Plans are being completed to make the first sentation at the annual meeting to be held in Angeles next March.

The four approved awards are:

ASTE Gold Medal
ASTE Progress Award
Joseph A. Siegel Memorial Award
ASTE Engineering Citation

The ASTE Gold Medal is made available to either a member or nonmember of the Society and will be presented for outstanding service through published literature, or technical writings.

Also available to a member or nonmember, the ASTE Progress Award will be given to honor engineering accomplishments in the field of manufacturing techniques and production methods.

The Joseph A. Siegel Memorial Award will be limited to a Society member for contributions through leadership, voluntary support, or acts of timely benefit to ASTE. This medal will be perpetuated by past presidents of the Society in honor of Joseph A. Siegel, the first president of ASTE.

The ASTE Engineering Citation, also limited to a Society member, will be presented for unusual skill in the development of tool engineering principles.

Designs for the four awards were approved at a recent meeting of the Honor Awards Committee. It is planned to make all four awards of the plaque type, suitable for wall mounting. The gold medallions will be approximately three inches in diameter, and the plaque about eight by ten inches in size. A rectangular plate below the medal will include the recipient's name and other specific references to the awards.

With each medal will be prepared an engraved certificate, about eight by ten inches and mounted in a glass frame, also for wall mounting.

Nominations for honor awards from any member or group of members are welcomed by the committee. A complete case to establish the qualifications of the individual to be nominated must be presented.

Since the committee considers nominees in many fields of specialization and performing many engineering functions, it must rely primarily upon the written records submitted. These proposals should be prepared on the assumption that the nominees are completely unknown to the committee.

Nominations must be submitted by December 1 of any year to be considered for honors and awards for that year and should be sent to the chairman of the Honor Awards Committee, American Society of Tool Engineers, 10700 Puritan Avenue, Detroit 38, Mich.

The Honor Awards Committee is composed of nine past presidents of the Society. Each year the active chairman is retired, to be succeeded by the next oldest in term of office, and also each year a new member is added to the committee so that in general each member will serve the group for nine years. This year's chairman is T. Bert Carpenter, who served as the third president of the Society. He succeeds William Smila.

Brochures Tell Industry about ASTE Research Fund

Printed brochures about the ASTE Research Fund and what it does were recently sent to hundreds of industrial executives, editors of 125 technical and business publications, ASTE chapter officers and public relations chairmen, and to all national officials of the Society.

Written under the supervision of Col. Leslie S. Fletcher, research director, the eight-page booklet tells how the ASTE Research Fund is accomplishing its purpose of fostering research in the broad field of tool engineering. Criteria for accepting projects are outlined, as are the activities of the ASTE Research Fund Committee, which administers the Fund.

Copies of the brochure are available at ASTE national headquarters and can be obtained by writing to Col. L. S. Fletcher, ASTE Research Fund, 10700 Puritan Ave., Detroit 38, Mich.

destination: LOS ANGELES

Going West by Car Offers Ideal Way to See the Country

Hoover dam, the largest in the world, is one of this century's outstanding triumphs of engineering and construction. At its foot is Lake Mead, the world's largest man-made body of water.

Cross country highway travel has many advantages for ASTE members who plan to drive from points east of the Rockies to Los Angeles for the 1955 Western Industrial Exposition.

While not the fastest means of getting to the West Coast, going by car is hard to beat for economy, particularly when there are two or more persons making the trip; and, for geting an intimate close-up and leisurely look at the land we live in, it is the only way.

Transcontinental highways are modern and efficient. Accommodations are plentiful and the ASTE motorist heading West is offered some of the finest overnight stopping places, both in roadside motels and in city hotels.

In suggesting an itinerary to Los Angeles from the East for winter travel, the American Automobile Association points out there are several possible routes available, depending on the traveler's interest and allowance in time.

Snow and ice and just plain cold weather are important factors to reckon with in planning a winter motor trip. Yet, winters have been getting steadily milder and roads closed much less than in other times. This trend in nature, coupled with improved snow removal methods employed by state highway departments, has facilitated the year-round travel of motorists in even the bleakest areas.

This means that car owners who choose to cross the country on the more northerly routes will likely be as sound and as safe as those on any other route. Though snow may fall, chances are that crews will be out soon after it hits the ground. In this connection, Colorado is proud to note that major roads, even as they cross the high mountains, are kept open all year.

Considering the possible routes to Los Angeles, first from Chicago and then from the East Coast, motorists have these to choose from.

Once a quiet desert town, Las Vegas has grown up as one of the most noted vacation centers in the West, known for its night spots and top Hollywood entertainment.

The most northern route heads due west on U. S. 30, across Illinois, Iowa, the gradually rising prairie terrain of Nebraska, Wyoming and into Salt Lake City. There, in the capital of the Mormon territory, this route heads south on U. S. 91, down through Utah and across the southern tip of Nevada.

Here it goes through Las Vegas and near Lake Mead National Recreation Area, both popular as winter tourist objectives. Las Vegas, once a sleepy desert town, has grown up as one of the most noted vacation centers in the West.

From Las Vegas it is little less than 300 miles to Los Angeles. The total distance from Chicago over this route is 2,178 miles.

Mileage is about the same on the next route south, which begins by driving down from Chicago, then west on U. S. 40 until it intersects U. S. 54 at Fulton, Missouri. On both these routes there is chance of cold weather and snow as far as the Southwest (in fact, even beyond Albuquerque), and it is in that moderate climate where most motorists would begin their earnest sightseeing. This route, U. S. 54, dips south through the Ozark highlands of Missouri, across southern Kansas and the Panhandle of Oklahoma and Texas into New Mexico, where it continues on U. S. 66, and Albuquerque. The largest city in the state, Albuquerque, is a well-known health and tourist resort, particularly interesting for its pueblo architecture and other aspects of ancient Indian life. Within easy driving distance are several Indian settlements, still occupied, which are believed to be the oldest communities continually in use on the Continent.

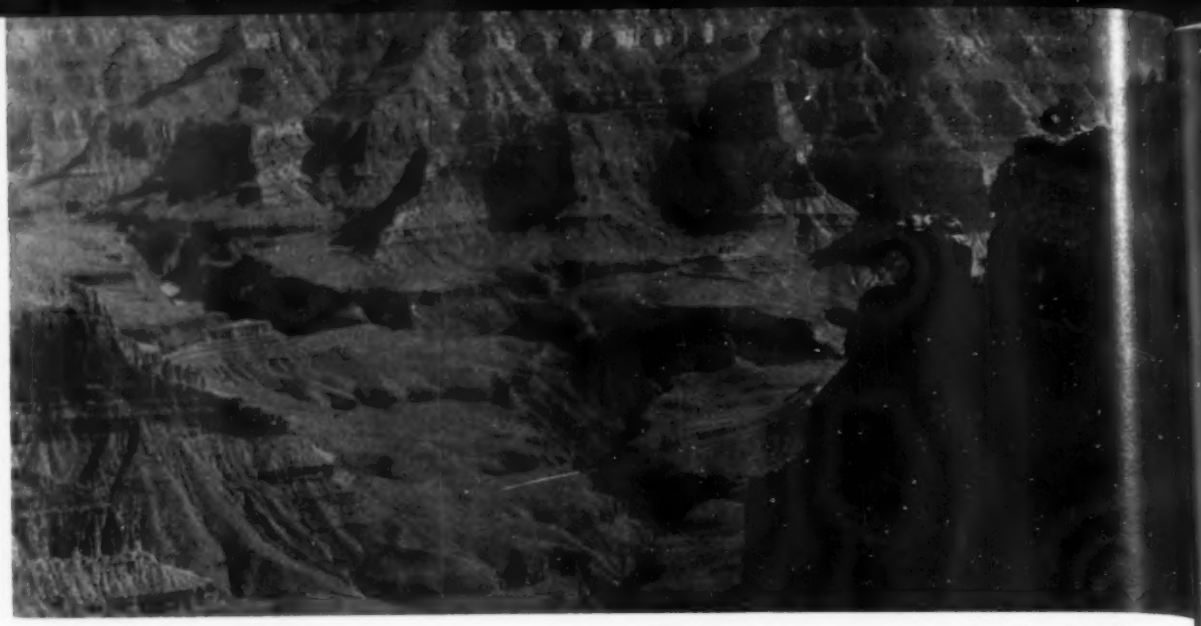
Arizona likewise is marked by outstanding points of interest, combining the architecture, culture and customs of the Indian, Spaniard and the once Wild West with the natural spectacles wrought long before the advent of man. The most wondrous of all is the Grand Canyon, north of U. S. 66, where the South Rim is open to visitors the year around, and which, in fact, is easier to appreciate during the winter months, when crowds are thinner than any other season. Heavy snows close the North Rim, across the Colorado River, from October 15 to May 15.

The South Rim drives cover 35 miles on well-paved roads, with a series of incomparable views. The South Rim includes El Tovar Hotel and Bright Angel Lodge, for which reservations can be made through Fred Harvey, Inc., Grand Canyon, Arizona.

From Williams, Arizona, on U. S. 66, south of the Grand Canyon, it is more than 400 miles, or a good day's drive to Los Angeles, across the Mojave Desert, San Bernardino and Riverside.

A partial alternative to this route is to follow

Continued on next page



Open the year around, the South Rim of Arizona's Grand Canyon is easier to appreciate in the winter when crowds are thinner than any other season.

In the heart of New Mexico's Navajo Indian country, Shiprock serves as a spectacular marker to travelers on U.S. Highway 66.

U. S. 66 all the way from Chicago, through Springfield in southern Missouri, then over the new Turner Turnpike, from Tulsa to Oklahoma City, and the Texas Panhandle.

Still another is to drive due south from Chicago to Jackson, Tennessee, and Memphis, in the balmy land of cotton, then west across Arkansas and Oklahoma on U. S. 70, then either north to join U. S. 66 in Texas or New Mexico or continuing along southernmost tier of the West.

A number of motorists heading for California during the winter like to include a swing through the South. For one thing, they are sure of escaping the belt of snow and cold and, for another, are able to visit some outstanding points of interest.

Vicksburg, Mississippi, for instance, is included in many itineraries. It was the "Gibralter of the Confederacy," important militarily to both sides in the Civil War, and finally taken after a 47-day siege by Grant, who said, 'When Vicksburg fell the fate of the Confederacy was sealed." Vicksburg National Military Park embraces the positions held by both sides.

From Vicksburg, Route 80 leads westward across Louisiana, through Dallas and Fort Worth in Texas. Here some motorists drive even further to the south to have a look at San Antonio, one of the most picturesque and historic cities in America, and a favorite winter playground. It has lived under six flags—French, Spanish, Mexican, Republic of Texas, Confederate, and the United States. San Antonio's most noted point of interest is the Alamo, built in 1718 by the Franciscan fathers as a church and fortress but used finally as the last stronghold of the gallant fighters for Texas independence in 1836.

U. S. 80 passes through El Paso, facing Ciudad Juarez across the Rio Grande, then north across New Mexico into Phoenix, Arizona. This desert metropolis, in the center of the fertile Salt River Valley, has blossomed as a popular winter resort spot.

There are a number of interesting short trips in the Phoenix vicinity, including the drive over the spectacular Apache Trail, which begins at Apache Junction, 34 miles east. The Salt River and Pima Indian Reservations are nearby, as are Casa Grande and Tonto National Monuments.

From Phoenix the route to Los Angeles extends

ough Southern California on U. S. 60-70 near Joshua Tree National Monument, the winter resort at Palm Springs and San Bernardino.

These same routes also are the principal ones from the East Coast. From New York the most direct heading would be south on the New Jersey Turnpike to connect with the Pennsylvania Turnpike near Philadelphia, then across the Keystone State, and on U. S. 40 through Ohio, Indiana and Illinois, linking up with U. S. 54 at Fulton, or 66 at St. Louis. Distance this way, via U. S. 54, is 2,884 miles from New York to Los Angeles.

Some travelers choose, however, to go the long way around, journeying directly south along the East Coast into warmer climates before turning west. Many would rather extend their travel time by going to Savannah, then on U. S. 80 via Macon, Georgia; Montgomery, Alabama; and Vicksburg, Mississippi.

One of the most important elements in long-distance motoring is advance planning: to figure the number of days involved for travel time; the budget necessary for such essentials as food, lodgings, and car operation; to have a general idea of sightseeing to be done on the way. Many a motor journey has gone awry through failure to make a few simple plans in advance.

Bear in mind the AAA caution that the average motorist covers about 100 miles in three hours of driving—including time out for gas, refreshments and meal stops. In the congested East it is sometimes difficult to make this pace, while in the wide-open West miles roll by faster. Overall, a nine-hour driving day will cover about 300 miles, possibly somewhat more in the West.

In considering overnight stopping places, the likelihood is that reservations are not necessary, in view of the large number of accommodations, both roadside motor courts and city hotels, now available to motorists. However, it is wise to know where the better accommodations are located. It is also wise to plan to stop early, by 5 or 6 p.m., to insure getting the type of lodgings wanted and to have plenty of time for dinner.

In 1903 Dr. H. Nelson Jackson made the first cross-country trip by car, in a Winton. It took him 63 rugged days to make it from San Francisco to New York; now, fifty-one years later, the journey from one coast to another is a pleasant and practical experience for any car owner.

Motorist taking U.S. 80 through Arizona often stop at Phoenix to see the Indian dances performed at the Pima reservation.

Matson Lines photograph

Hawaiian

By Edith R. Saunders
Assistant News Editor

Holiday Beckons ASTE

Seven-Day
Island Vacation
Offered Members by United Airlines

In making plans to attend the Western Industrial Exposition in Los Angeles, travel-minded ASTE families may want to consider a trip to Hawaii as a post-convention vacation.

With the island just 9 and ¾ hours by air from Los Angeles, there is a certain temptation to take advantage of the location of ASTE's exposition city.

Contemplating the many attractions of an Hawaiian holiday may heighten the temptation.

For a mid-winter vacation on the sub-tropic isles, March is the ideal month. Sunny warmth tempered by trade winds makes for the best and most consistent climate in the world.

Life is leisurely. You can loaf on Waikiki Beach,

I am interested in an ASTE post-convention trip to Hawaii offered by United Airlines. Please send free literature and rate data. I understand there is no obligation.

Address _____

Name _____

City _____ Zone ____ State _____

Send to: ASTE Headquarters, c/o News Editors, 10700 Puritan Ave., Detroit 38, Mich.

wim in the gentle surf, or rent a car to tour the many scenic and historically famous spots.

As a sight-seer, you can visit the summit of Nuuanu Pali for one of the world's most breath-taking views; Bishop Museum, rich in Polynesian relics; Iolani Palace, where Hawaii's kings lived; and the Mormon Temple, an architectural masterpiece.

A walk along the palm-shaded avenues of Honolulu can take you to some of the Orient's most colorful shops and restaurants.

The quickest way to get to Hawaii—and to have more vacation time for spending just as you wish—is to fly. And air rates may be lower than you think.

United Airlines charges $271 plus tax for a seven-day package trip which includes round-trip fare, six nights in Hawaii, and accommodations at Waikiki Beach Hotels. Meals are on the American plan, giving visitors full range to try the famous dining spots on the island.

If an air trip to Hawaii stimulates enough ASTE member interest, United Airlines will be able to run a special plane, provide additional 'extras' and services, and perhaps offer lower group rates to ASTE travelers.

For further information, fill out the coupon on the opposite page and send it to the ASTE headquarters, 10700 Puritan Ave., Detroit 38, Mich.

You will receive brochures telling everything you'll want to know about air trips to Hawaii, hotels on the island, and what to do and see without being under *any type* of obligation.

Nuuanu Pali affords a beautiful panoramic vista.

Aloha Tower welcomes visitors to Hawaii

San Jose State College

Scene of On-Campus Conference

By John T. McCarthy
Chairman, Santa Clara Valley Chapter

The head table at the conference luncheon includes from left: W. C. Lanyon, past chairman of Santa Clara Valley; D. Gustafson, past chairman of Golden Gate; John T. McCarthy, Santa Clara Valley chairman; and Wayne Ewing, national ASTE secretary.

A two-day on-campus tool engineering conference, sponsored by Santa Clara Valley and Golden Gate chapters, was held September 10 and 11 at San Jose State College, San Jose, Calif. The meeting was held with the cooperation of the Department of Engineering at San Jose State College and local carbide manufacturing companies.

Theme of the meeting was "Modern Carbide Tooling." The full two-day program included tours of the School of Engineering and the mechanical and electrical laboratories, four technical sessions, two luncheon meetings, and an informal group discussion period.

National representatives of ASTE who took part in the program were: Wayne Ewing, national secretary; and Prof. Frederick Preator, member of the National Education Committee.

The welcome address was made by Dr. Ralph J. Smith, head of the Engineering Department, who discussed the need for a new approach to the engineering curriculum. Chairman of the Conference Committee was Carl Kaiser, education committee chairman of Santa Clara Valley chapter.

The first technical session featured a talk and

At a technical session on "Milling with Helical Carbide Cutters," principals were: M. Hillard, general manager; E. C. Sunderman, product supervisor; R. L. Stevens, manager of sales engineering at Sonnet Tool and Manufacturing Co.; and J. Cowan, carbide coordinator for Douglas Aircraft Co.

ovie on "Development of Carbides and Their roper Place in Today's Production Program" by . D. Mack, Pacific district manager, Carboloy Department, General Electric Co.

At the Friday luncheon session, John T. McCarthy, Santa Clara Valley chapter chairman, cted as host. Program speaker, Wayne Ewing, iscussed ASTE national and chapter levels of peration.

The afternoon session was an address by Malcolm Judkins, chief engineer for Firth Sterling Inc., on "Gambling Doesn't Pay in Carbide Tool Fabrication and Maintenance." Mr. V. E. Diehl, past chairman of Santa Clara Valley chapter introduced the speaker.

The third technical session on Saturday morning was a program presented by George Dolan, Pacific Coast district manager, Kennametal, Inc., on "It Pays to Be a Good Tool Detective," emphasizing proper analysis of carbides. Mr. Dolan was introduced by Wm. C. Lanyon, past chairman, Santa Clara Valley chapter.

The Saturday luncheon was emceed by J. T. McCarthy, Santa Clara Valley chairman, who introduced Prof. Frederick Preator, member of the National Education Committee and head of the Tool Engineering Department at Utah State Agriculture College. Prof Preator spoke on the educational programs of ASTE.

Malcolm Judkins | Dr. Ralph Smith | George Dolan

The final technical session was a panel discussion on "Milling with Helical Carbide Cutters" by M. Hillard, general manager; E. C. Sunderman, production supervisor; R. L. Stevens, manager of sales engineering at Sonnet Tool and Manufacturing Co.; and J. Cowan, carbide coordinator, Douglas Aircraft Co.

Following this last session, the meeting was divided into three informal group discussions on "Grinding Carbide Tools," "Carbide Dies" and "Milling with Carbides." A total of 121 tool engineers and guests registered for this two-day session.

ASTE Conferences for November

ASTE members in Iowa, Pennsylvania, and Michigan will want to make special note of the schedule of on-campus conferences to be offered in their areas during November.

On the 13th, conference activity will get double attention with programs slated for both the State University of Iowa and Lehigh University. One week later, on November 20, the second tool engineering conference will be presented at University of Michigan.

"Controlling the Immeasurable" will be the theme of the one-day conference, first to be held at the State University of Iowa, Iowa City, Iowa. Slanted toward management men, foremen and superintendents, it is sponsored by the Cedar Rapids chapter in cooperation with Des Moines and Tri-Cities chapters of ASTE. Also cooperating in the project are the Quad Cities Time-Study Engineers, Central M. T. M. Association, and the Industrial Engineers Association of Iowa.

Lehigh University's first on-campus conference will also be a full-day program. Sponsored by the Pennsylvania chapters headed by Lehigh Valley, it will feature technical sessions, ladies' activities and a banquet.

Luncheon speaker will be Dr. Harry B. Osborn, Jr., first vice president of ASTE, while the guest speaker at the banquet will be A. C. Bodine, president of the Bodine Corp., Bridgeport, Conn.

Just one week later, November 20, the University of Michigan, Ann Arbor, Mich., will be host to a conference sponsored by the Ann Arbor Area, Detroit, Toledo, Windsor, Saginaw Valley, Pontiac, and Jackson chapters, as well as the University of Michigan student chapter. Theme of the conference will be "Planning for Tomorrow's Cost Reduction." Early registration is urged.

NATIONAL COMMITTEES

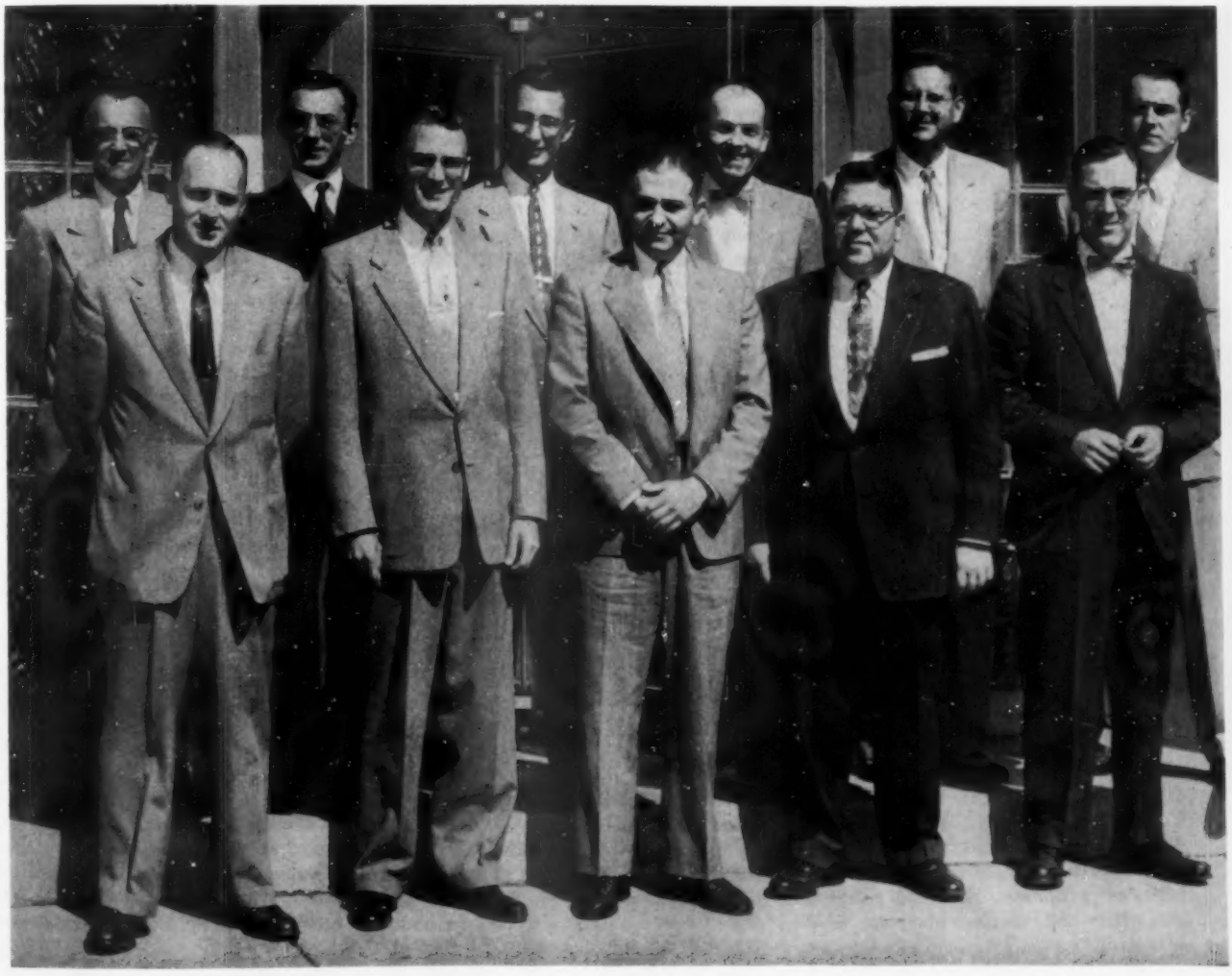
Hold Fall Meetings

Future education activities of ASTE were discussed at the recent meeting of the National Education Committee. Participating, from left, were: Marvin Bunting, committee secretary; Prof. Orville B. Lascoe; Dr. Harry B. Osborn, Jr., ASTE first vice president; Prof. Frederick Preator; Prof. Robert E. McKee, committee chairman; Carl J. Oxford, Jr.; Cyril R. Mitchell; Prof. Myron L. Begeman; and Prof. C. C. Lasater.

Reviewing ASTE's budgets for next year was the job of the National Finance Committee at its autumn session. Taking part, from left, were: R. C. W. Peterson, national treasurer; H. A. Rockwell; Charles Prince, headquarters office manager; Harry Anderson, chief accountant at ASTE headquarters; Harry E. Conrad, Society executive secretary; Fred Kampmeier, committee chairman; Allan Ray Putnam, assistant executive secretary; Dr. Harry B. Osborn, Jr., ASTE first vice president; F. E. Anderson; Duane H. Brighton; and Frank Hausfeld, Jr.

Chairman John X. Ryneska, left, emphasizes a point at the Constitution and By-Laws meeting. Shown with him, from left, are: Marvin Bunting, committee secretary; C. Russell Miller; Arthur Cervenka; and Vincent M. Spahr.

The carbide subcommittee of the National Standards Committee met at ASTE headquarters to continue its work on writing a standard on single joint carbide tools and tool holders to be submitted to the American Standards Association for approval. Back row: W. W. Morris, M. G. Rumora, W. H. Seacord, H. J. Inch, W. L. Kennicott, and J. L. Gendron. Front row: G. M. Hargreaves of the ASTE staff, C. J. Nauta, C. Williamson, G. Monacelli, and J. F. McCreery. Chairman David Kaufman was not present for the photograph.



Thomas Bradford Dies While on Vacation

Thomas C. Bradford, 71, member of the National Membership Committee and one of ASTE's most loyal supporters, died August 19 while on vacation at the Lighthouse Inn in West Dennis on Cape Cod. Associated with the industrial oil and tool industry in New England for almost 30 years, he was New England area representative of the F. E. Anderson Oil Co. of Portland, Conn., and a field technical engineer for the last seven years.

T. C. Bradford

Mr. Bradford, a major in World War I, served as an instructor at Fort Devens and at Plattsburg, N. Y.

In addition to the ASTE, he was an active member of the Worcester chapters of American Society for Metals, Society of Carbide Engineers, American Society of Lubrication Engineers, American Society of Mechanical Engineers and the Army Ordnance Association.

Chautauqua-Warren Tours Bethlehem Steel Plant

Nearly 300 members and guests of the Chatauqua-Warren chapter spent Saturday, September 18, touring the Bethlehem Steel Co. plant at Lackawanna, N. Y.

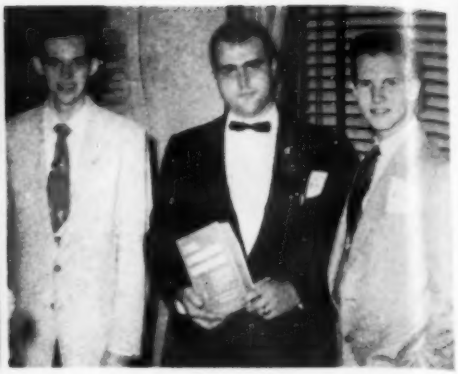
The visitors viewed operations ranging from the unloading of raw materials to the shipment of the finished products, and saw the coke ovens, blast furnaces, open hearths, blooming mill, bar mill, strip mill and the cold mill.

Luncheon was served after the tour at the Supervisory Force Social Club. Arrangements for the visitation were made by Elbert W. Garrison, program chairman, and George Cushman, district sales manager for Bethlehem Steel.

—L. H. Beau Jean

Fox River Members Hold Golf Outing

St. Andrews Golf Club near St. Charles was the scene of Fox River Valley chapter's annual golf outing. Approximately 65 members and their guests turned out for the event which included a dinner. Some 40 received golf prizes and everyone who came went home with a door prize.—*W. C. Perkins*



LOUISVILLE ESSAY WINNER—At left, Chairman George H. Wilhelm presents a check for $100 to James Nuss, winner of the chapter's essay contest held in the public schools. On the right, from left, are: David Billings, runner-up; Joe Hammer, last year's winner of the contest; and Mr. Nuss.

Chapter Hears Die Cast Expert

Program speaker at the September 21 meeting of the Northern Massachusetts chapter was D. V. Stevens, sales engineer of Doehler-Jarvis Die Casting Co., Pottstown, Pa. He was assisted by Henry Van Dyke, metallurgist at the company.

The program was on "Fundamentals in the Designing and Tooling of Die Castings." Highlights were a sound film depicting processes of designing and manufacture of castings, a display of castings, and a lively discussion period. The meeting was held at the Greenfield Country Club, Greenfield, Mass.

The chapter also announces extension courses which it is sponsoring in cooperation with the University of Massachusetts which is offering individuals in the area to earn a college degree in mechanical, electrical or chemical engineering. The seven-year course has been met with much enthusiasm in the area.

—Otto S. Nau

Milling Expert Addresses Tri-Cities ASTE Meeting

Tri-Cities chapter started its fall season with a dinner meeting at Rock Island Arsenal cafeteria on September 8. The program was presented by Dr. H. A. Frommelt of the Detroit Milling Cutter Co. and author of the milling section in the *Tool Engineers Handbook*.

After a technical discussion of new concepts of carbide milling, Dr. Frommelt and Tri-Cities members drove to the Swan Engineering Co. at Bettendorf, Iowa, where the speaker continued his program with shop demonstrations. *—Clifford C. Vogt*

Louisville Awards Scholarship to Essayist

Louisville chapter, after holding an essay contest in the Louisville public schools, announced the winner at their September 14 meeting. Grand prize winner, who wrote on "The Tool Engineer — His Function," was James Nuss. The prizes included $100 scholarship, an ASTE Handbook and a student membership in the chapter. Second prize winner, David Billings, received an ASTE Handbook and a student membership. *—Sam T. Gleaves*

Mohawk Valley Members Tour Bendix Aviation

Some 70 members and their guests of Mohawk Valley chapter toured the Utica Division of Bendix Aviation Corp. on September 28. The group was welcomed to the plant by D. M. McGrath, general manager, who gave a brief history of the plant and its operations.

Members saw various electrical and turbine-driven accessories in manufacturing process and assembly. E. M. Harris, director of training for the division, was in charge of arrangements, and E. J. Masucci, past chairman of the chapter, described some of the products that were manufactured.

—E. J. Masucci

North Texas Announces $500 Scholarship Award

The executive committee of North Texas chapter met September 28 and voted to allocate $500 for a scholarship to a deserving student from the area to study some phase of tool engineering. Recipient of the first scholarship from North Texas chapter was John Alterman from North Dallas High School.

—R. E. McMahan

Lehigh Meeting Covers Subject of Automation

A crowd of 150 members and guests of the Lehigh Valley chapter met at Hotel Traylor, Allentown, Pa., to hear a discussion on "Automation, as Applied to Machine Tools." The meeting held September 17 was addressed by John Keates, manager, New York Sales Office, National Automatic Tool Co., Richmond, Ind.

Mr. Keates was quick to point out that automation was not the solution to all our production ills. Before automation is established in any industry, according to Mr. Keates, three criteria should be considered: high volume production, little or no change in the product; and ample capital. He emphasized that the extent of an automatic production system becomes a very individual problem with each industry analyzing its needs so that a profitable venture is maintained in its production program.

—Paul Gehris

Tool Life Discussed at Chicago Meeting

Two speakers discussed "Tool Life" at the September 13 meeting of the Chicago chapter held at the Keyman's Club. Approximately 200 members and guests heard Clarence L. Fralick, chief of perishable tool research, International Harvester Co., Melrose Park, Ill., and Chester S. Johns, industrial engineer, The Cross Co., Chicago, Ill.

Mr. Fralick discussed how tool life of cutting tools is measured and how different conditions affect the life of a tool. Proper usage was emphasized as a key to prolonged tool life.

Mr. Johns covered selection, operation and maintenance as various factors in tool life. He also talked about reclaiming tools for other usage thereby obtaining maximum life from tools.

—R. C. Berliner

New Orleans Hears Lubrication Specialist

Donald L. Espey, lubrication specialist for Standard Oil Co. of New Jersey, was the guest speaker at the first meeting of New Orleans chapter for the fall term. The meeting, held in September, featured a film which described the many laboratory tests made by the oil company to determine the proper lubricant for various operations.

—Joseph Natal

ROCKFORD SPEAKERS — Edward Holt, center, patent attorney, and William Knapp, vice president of Mattison Machine Tool Co., presented the September program for 110 members of the Rockford chapter. Pictured with the speakers is Program Chairman H. Walter Lewis.

Vice President Talks on Grinding Problems

Using films to illustrate his discussion, William Knapp of Mattison Machine Tool Co., addressed the September meeting of the Rockford chapter at the Lafayette Hotel. He spoke on production grinding problems and various types of machines used in grinding work.

The coffee speaker on the program was Edward Holt, patent attorney.

—Les Teachout

Plant Safety Discussed at London-St. Thomas

The London-St. Thomas chapter opened its first meeting of the season on September 16 at the Cobblestone Inn, London, Ont. Harry Mabson, chief inspector, Industrial Accident Prevention Association of Ontario, was guest speaker. In discussing his topic "Safety Measures in the Toolroom," Mr. Mabson pointed out that most accident cases could have been prevented had a fellow worker taken enough interest to reveal hazards on a job.

—W. Reid Grice

Tangent Bending Topic at Twin Cities Meeting

"Tangent Bending" was the subject of a talk given by Allan Rowley for 65 members of Twin Cities chapter who met at Dunwoody Institute on September 3.

Mr. Rowley is sales manager for Struther Wells Corp., Machinery Division, Titusville, Pa. With the aid of colored slides, he explained the various types of tangent bending machine manufactured by his company. According to Mr. Rowley, these versatile machines are capable of radially edge bending smooth flanges on preformed material, sheets, structural shapes and tubes.

—Walter Comstock

Changes in Social Security Act Will Affect All Members of ASTE

The 1954 amendments to the Social Security Act will affect every member of the American Society of Tool Engineers. Members already covered by the law will pay taxes on earnings up to $4600 a year, beginning next year, rather than on $3600 as heretofore, but will get greater dollar protection for their money.

Beginning January 1955 self-employed professional engineers will be covered by Social Security for the first time. They will have the same insurance protection other engineers have through their status as employees or self-employed individuals. Coverage for the self-employed professional engineer is compulsory—no take it or leave it. A self-employment tax report must be filed annually as part of the Federal income tax return. The first report covering 1955 is due in 1956.

Pre-amendment maximum monthly payment to a retired worker was $85. The 1954 changes raise the amount to $98.50, beginning September 1954, with an ultimate maximum of $108.50 by mid-1956. If the retired worker has a wife over 65, their maximum can be as high as $162.80. These maximum amounts presuppose a minimum of one and one-half year's earnings after 1954 at $4200 a year.

Survivors' payments are also increased. Families of workers who die at any age may now receive monthly checks for as much as $200, as against the old high of $168.90.

Local social security offices can give further information about the expanded program and how it affects members individually. Also available are free pamphlets explaining the new law in greater detail.

TOOL ENGINEERING SCHOLARSHIPS—One thousand dollars in ASTE scholarship funds have been made available to tool engineering students at Utah State Agricultural College. The awards, one a national scholarship from the Society and three presented by the Salt Lake chapter, are for the 1954-55 school year. Pictured, from left, are: Prof. Frederick Preator, head of the UTAC tool engineering department and a member of the ASTE National Education Committee; Dr. H. Aldous Dixon, president of the college; and Prof. J. E. Christiansen, dean of engineering. USAC is the only school in the United States with a four-year curriculum for a degree in tool engineering.

Positions Available

MANUFACTURERS' AGENTS WANTED—for the new Melo-O-Flo Coolant Aerator, a new patented device that eliminates splashing of coolants. National advertising campaign will break shortly. All territories are open. Melard Mfg. Corp., 432 Austin Pl., New York 55, N. Y.

CHIEF ENGINEER—Graduate M. E. with 17 years' experience in metalworking. Knows supervision, tool and machine design, methods, cost estimating. Currently employed as chief engineer by a medium-sized contract manufacturing concern making small mass-produced metal parts for the automotive, electrical and novel industries. Will relocate. Write to Box 003, News Department, The Tool Engineer, 10700 Puritan Ave., Detroit 38, Mich.

Positions Wanted

METHODS ENGINEER—desires a change to a position where iniative is required. Has a good background in general tooling, machining, precision assemblies, furnace and dip brazing assembley processes, and has been a manufacturing consultant to engineering. Location preferred within 50 miles of New York City. Write to Box 008, News Department, The Tool Engineer, 10700 Puritan Ave., Detroit 38, Mich.

TWO PAST ASTE CHAPTER CHAIRMEN—with proven sales ability, would like to represent four machinery builders or machine tool makers in northeastern Ohio. We will not represent competing lines. Please write to Box 009, News Department, The Tool Engineer, 10700 Puritan Ave., Detroit 38, Mich.

TOOLMAKER—seeks work in the United States. Have been in Toronto, Canada, since 1951 and am 38 years old. Well-experienced in blanking, forming, drawing dies, progressive dies. At present employed as a tool designer in this field. Prefer California or Mid-West. Write to Box 007, News Department, The Tool Engineer, 10700 Puritan Ave., Detroit 38, Mich.

EXECUTIVE MANAGEMENT ENGINEER—44, diversified proven record in manufacturing, engineering and sales in metal industry and all white appliances. Seasoned from cost control to punch press and welding operations. Have initiative and maturity to handle management position or assist top management. Write to Box 004, News Department, The Tool Engineer, 10700 Puritan Ave., Detroit 38, Mich.

TOOL ENGINEER—46 years old with more than 20 years' experience building everything from bombsights to trailers, is interested in a position of master mechanic or an equivalent responsible position. Complete resume available. Write to Box 006, News Department, The Tool Engineer, 10700 Puritan Ave., Detroit 38, Mich.

PROCESS ENGINEER—experienced in automotive and aircraft engineering, aged 40, desires challenging position where 2 years of college, 2 years' administrative, 6 years' special machine design and 3 years' processing are prerequisites. Presently employed. Position must offer lasting security and growing possibilities. Resume sent upon request. Write to Box 005, News Department, The Tool Engineer, 10700 Puritan Ave., Detroit 38, Mich.

Exhibit Dramatizes Development of Tools

"How Civilization Developed through Tools" was the topic of a program precented September 9 for the Milwaukee chapter. Nearly 150 members attended.

The speaker was C. G. Schelly, managing director of the Wilkie Foundation, Des Plaines, Ill., who described an exhibit sponsored jointly by the Foundation and the DoAll Co. The display showed the evolutionary development of tools, embracing an estimated time span of at least one million years.

Several new members were introduced and given ASTE membership pins. Guests at the meeting included scholarships winners from the past four years. —*Walter Behrend*

Nashville Visits Solar Steel Corp.

Nearly 50 members and guests of the Nashville chapter met September 21 at the Solar Steel Corp. for a plant tour, dinner and technical session. Al Price was host for the event. The talk on the different types of tool steels was given by Herman Rittger, tool steel production manager for Solar Steel.

—*Harry O. Collins*

Memphis Members Visit International Harvester

Close to 60 members of the Memphis chapter visited the Memphis Works of the International Harvester Co. for the September meeting. The program included a plant tour which gave a first-hand view of company operations, and a film "Inside Harvester" which showed views of other Harvester plants.

—*Frank Fly*

Detroiters Learn About Industrial Atomic Power

Industrial development of atomic power was discussed September 16 at a meeting of Detroit chapter members. Speaking at the session, which was well attended by the junior section of high school and college students, was Robert Hartwell, in charge of nuclear power development for the Detroit Edison Co.

He said that the reason the Edison Co. is progressing so rapidly with its atomic program is because of its association with 20 other firms, all interested in atomic power. It is expected that Detroit Edison will be using atomic power within five years, he said.

In August, Detroit ASTE members turned out for the annual stag outing held at Glen Oaks Country Club. Winners of the day included Eugene Mackie who won the low member golf trophy; Bill Nettle who carried off the non-member honors; and George Fish who won the pot-o-gold contest.

—Walt Shober

Evansville Members Hear John C. Kosky

Guest speaker at the Evansville chapter's September 13 meeting was John C. Kosky, director of public relations at Wales-Strippit Corp., Buffalo, N. Y. He spoke on "Cost Reduction through Modern Punching Methods" before a crowd of 80 ASTE members gathered at the Shrine Temple.

Mr. Kosky explained low-cost punching methods through the use of self-contained dies and punches and how they can be used in small quantity production or for special parts. Coffee speaker was Paul W. Rice, city traffic engineer in Evansville who spoke on "What is Wrong with Traffic in Evansville?"

—Guenther F. Wulf

Consultant Discusses Photo Elasticity

A talk on photo elasticity was heard by the San Fernando chapter at its September meeting. Program speaker was Dr. Max L. Williams, Jr., member of the faculty at the California Institute of Technology and consulting engineer for Douglas Aircraft Co., American Machine and Foundry Co., and the U. S. Naval Ordnance Test Station.

In his discussion Dr. Williams pointed out the many different uses of photo elasticity in the aircraft industry. Slides were used for illustration. The technical session was attended by 63 members and guests.

—A. J. Soares

Comdr. Weisbecker

Dayton Chapter Hears Plastic Tooling Talk

Some 110 members and guests of Dayton chapter met at Suttmiller's Restaurant on September 13 to hear "Uses of Plastics in Present Day Tooling." Speaker was E. A. Jonasch of Allen Tool Co., Springfield, Ohio, one of the pioneers in plastic tooling research. He was assisted in his presentation by Billy B. Curl who prepared several samples and plastic build-ups for demonstration.

Mr. Jonasch purposely covered only briefly some of the background of the subject and then threw the meeting open to general question and discussion period, on the idea that members could learn more that way.

One of the features of the meeting was a color film of the events which took place at the July golf picnic.

—W. J. Killinger

Comdr. A. J. Weisbecker Addresses Potomac

The feature of Potomac chapter's September meeting was a lecture presented by Commander A. J. Weisbecker, USN, of the Bureau of Ships. Head of the Industrial Tool Engineering Branch of the Bureau of Ships, Navy Dept., Washington, D. C., Comdr. Weisbecker spoke on the subject "U. S. Naval Shipyards Tools and Tooling Standardization Conference." A film on tungsten carbide tools was presented by Thomas M. Kelley, civilian engineer on Comdr. Weisbecker's staff who is in charge of training and is also chairman of the "Tools Conference."

In his discussion Comdr. Weisbecker reviewed the history of the Tools Conference, which was established in 1948, and covered in detail the many accomplishments of the tool improvement program.

The program at the Hamilton Hotel was attended by 70 members and guests. Arrangements were made by A. M. Johnson, chapter program chairman.

ASTE Wives Attend Kansas City Meeting

Ladies night opened the 1954-55 meeting season for the Kansas City chapter. About 60 members and their wives attended the meeting held at the Memorial Building. The program included a showing of the film "Man of 1000 Hands," produced by the International Harvester Co. and narrated by Raymond Massey, which is the story of the building of communities in a country that is mostly wilderness.

—Richard W. Corliss

EVANSVILLE SEPTEMBER MEETING—A successful technical program is reflected in the faces of: from left, Bill Gaines, evening program chairman; John C. Kosky, speaker from Wales-Strippit Corp., Buffalo, N. Y.; and John Race, chairman.

Sir Walter Puckey Reports on Exposition

An interesting report on ASTE's 1954 Industrial Exposition has been published in the official journal of The Institution of Production Engineers, British counterpart to the American Society of Tool Engineers. The article was written by Sir Walter Puckey, president of the organization, who was a special guest at the Philadelphia Exposition and spoke at the annual membership banquet.

Included in his report are the following paragraphs:

"I was very impressed by the attendance and the degree of enthusiasm shown by most of those attending. The U. S. A. is a large country and it always impresses me to read on the label that is inevitably worn by those attending American conferences that the owner has travelled possibly 3,000 miles to attend. The fact that 7,000 to 8,000 people turned up each day, many from a great distance, speaks well for the enthusiasm of A.S.T.E. members. A similar enthusiasm was noticed at the conference sessions. I was struck, too, by the relative youth of those attending, and I formed the impression that they had not found it difficult to persuade their superiors that a long trip to Philadelphia for a few days was a justifiable company investment.

"Many members will know that each incoming President of the A.S.T.E. automatically becomes an Honorary Member of the Institution of Production Engineers, and it was my pleasure and privilege at the Annual Banquet held during the Exhibition to hand over the certificate of membership to the incoming President, Mr. Joseph P. Crosby. Nothing could have given me greater pleasure, too, than being presented by the retiring President, Mr. Roger F. Waindle, with a framed certificate of membership of the A.S.T.E., and being invited to say a few words to those present on the relationships between our two bodies.

"Altogether, my official visit to Philadelphia was one of great interest and inspiration, and I am grateful to our sister Institution overseas for the hospitality and courtesy extended to me as a representative of our members."

BALTIMORE SPEAKER—Leroy Rubright, first vice chairman, congratulates Speaker Dr. Duane L. Varney of the Knolls Atomic Power Laboratory for his contribution to a fine technical program. Dr. Barney used schematic slides to illustrate operation of the nuclear reactor.

Atomic Energy Reviewed at Baltimore Meeting

Dr. Duane L. Barney of the Knolls Atomic Energy Laboratory, Schenectady, N. Y., presented "Atomic Energy for the Layman" at the September 1 meeting of Baltimore chapter. Some 96 met at the Baltimore Engineers' Club where they saw schematic slides which helped them to understand operation of the nuclear reactor. Dr. Barney foretold that the atom's future will be guided very much by the tool engineer's ability to develop machines to use the power.

Coffee hour featured a film from Eastern Airlines on "Hunting and Fishing by Air."

Special guests were: Sam Boyer, member and past chairman of the Philadelphia ASTE chapter and area lieutenant-at-large for the National Membership Committee; H. E. Buffum, member and past officer of the Seattle ASTE chapter; and Dr. John W. Gryder of the Johns Hopkins University chemistry department.

On July 17, members and their families held a crab feast at Decker's Grove on the Chesapeake Bay. There was a turnout of 50.

—Neil Heller

Indianapolis Chapter Hears John Gall

John Gall of Model Trimmer Inc., Columbus, Ohio, was the guest speaker at Indianapolis chapter's September 2 meeting held at Sahara Grotto. Approximately 100 members and guests were present when he showed a series of slides on his company's machines.

He also showed examples of drawn shells with various shapes of trim lines and notches and a working model of the "Model Trimmer" which trimmed, notched and pierced a 1½-inch OD shell. *—Murray Davidson*

Ship Repair Topic for Portland Program

The Portland, Oregon, chapter met on September 16 at Burn's Restaurant to hear a talk on "Ship Repair." Speaker was William Wild, superintendent of the Ship Repair Division of Willamette Iron & Steel Co., Portland, Ore. He covered various stages of operations from bidding of a ship repair job to the final test run after the job is completed.

At a July executive meeting, Melvin Nielsen was awarded and presented with the past chairman's pin.

—Walter Brenneke

EDITOR SPEAKS AT SALT LAKE—Members attending Salt Lake City's September ASTE meeting heard a talk by Andy Rylander, technical editor for *Western Machinery and Steel World*. He described the great opportunities in tool engineering and told of some of his experiences during 50 years in the profession. Before moving to the West Coast, Mr. Rylander was technical editor for THE TOOL ENGINEER. Another guest at the meeting was V. H. Gallichotte of the National Professional Engineering Committee.—*L. N. Webster.*

Tucson Chapter Hears Lester G. Detterbeck

Members and guests of the Tucson chapter met at Marco's Restaurant on September 14 to hear one of their own members, Lester G. Detterbeck, talk on "Automatic Screw Machines." His fellow members are quite proud of him because he lives 110 miles from Tucson and has missed only one meeting since he joined. Mr. Detterbeck is owner of Lester G. Detterbeck Co. of Chicago.

Coffee speaker was Steve Cassedy, membership chairman, who revealed some facts and figures for comparison with other ASTE chapters.

Special guests were Jack Cissel of Cincinnati Milling Machine Co.'s Abrasive and Coolant Division in Los Angeles and Charles Sanford from the Los Angeles chapter. New members present were Mervin Hockenberry, Willian Chesney and Larry Freeman of Hughes Aircraft, Tucson.

—Joseph W. Vincent

Sales Engineer Talks at Greater Lancaster

The 76 members and guests of Greater Lancaster chapter who met at Meadia Heights Country Club on September 14, heard Edward P. Ranney as the guest speaker. Mr. Ranney is sales engineer for The National Acme Co., Cleveland.

As his topic Mr. Ranney chose "Modern Tooling for Bar and Chucking Automatics." He is a graduate mechanical engineer from Cornell University.

—G. E. Gallagher

Indoor Clambake Opens Elmira Meeting Season

Elmira chapter's opening meeting of the 1954-55 season was a strictly social one. On September 13 members and guests gathered at the Mark Twain Hotel for an indoor clambake, movies on hunting and fishing, and an informal discussion hour.

The films were presented by Elway P. Gray, co-owner of Gray-Grimes Tool Co., Detroit, Mich., who described some of his own hunting and fishing experiences.

Part of the evening's program was devoted to the presentation of two awards. Karlton Beach was given an ASTE service pin and Charles F. Roe was honored for his outstanding service to the chapter as membership chairman.

—Earl E. Marks

TUCSON TECHNICAL SESSION—Chairman Cy Jacobson, left, and Program Chairman Bob Pyers, right, congratulate Lester G. Detterbeck after a very successful presentation on "Automatic Screw Machines" at the September meeting.

Jerry Reinertson Talks at Calumet Area Meeting

Featured speaker at the September 15 meeting of Calumet Area chapter at Vogel's Restaurant, Whiting, Ind., was Jerry R. Reinertson. Mr. Reinertson is manager of the midwestern division of Pivot Punch and Die Corp., Chicago, and head of Jericho Engineering.

Some 120 members and guests heard him discuss lower costs for hole punching, short-run tooling and pivot punching. John A. Reiker and R. O. Julian, both engineers at Jericho, were also present.

—L. W. Montgomery

Mid-Hudson Sponsors 7 Engineering Classes

Fall sessions of education courses sponsored by the Mid-Hudson chapter opened in Poughkeepsie, N. Y. on September 13. Seven courses are being offered at Arlington high school; including: basic engineering I, II and III; shop math; advanced math; cost engineering; and punch and die design. The course in work simplification was postponed until January.

Instructors teaching the weekly classes are: Walter Cralle, J. F. McGovern, F. Fisher, L. M. Rutbell, Chris Noll, Jr., J. Pawling, and Edward J. Kozol. Sessions are held from 7 to 9:50 p.m., with a ten-minute break at 8. Enrollment fees are $5 per semester. Textbooks are purchased through the school at cost.

Letters announcing the classes were sent out in August by C. Morgan Newbury, chairman of the chapter's education committee; and Chris Noll, Jr., head of the professional engineering committee.

—Davis Gale

Western Michigan Holds Ladies Night

On September 14 at Blythefield Country Club, members of the Western Michigan chapter launched the 1954-55 meeting season with a ladies night event. Corsages of fall flowers were given to all guests as tokens of welcome from the chapter.

Chairman Charles Bonczyk opened the meeting and introduced the other officers for the present year: Arthur J. Cook, William G. Bylsma, John S. Pridgeon and James R. Wagner.

Speakers on the program were Harry J. Swanson, past chairman, who spoke on the role of the tool engineer in industry; and Merritt Lawrence, of the Grand Rapids Chamber of Commerce, who talked on the chamber's influence on community relations, welfare problems and industrial progress.

Somewhat on the lighter side, Stan Noxon, chapter member and Michigan representative for the International Brotherhood of Magicians, performed some sleight-of-hand artistry which left the audience wondering if it was coming or going.

—Jim Rost

Harry Gruwell Speaks to Muncie Chapter Members

Harry Gruwell, engineer at Indiana Bell Telephone in Muncie, was the guest speaker at the September 14 meeting of the Muncie chapter. "Transitors and Their Application to Communication" was the subject of his talk. He demonstrated working models of devices using transitors and showed how these and other engineering advances were permitting communications to meet the growing need for added capacity.

A tour of Muncie Exchange was also on the agenda. Mr. Dawn, local manager, was in charge.

—Darrell Marks

Henry Merriman Addresses Atlanta Tool Engineers

Henry H. Merriman, H. H. Merriman Co., Jackson, Mich., was the main speaker at the Atlanta chapter's September 20 meeting. A consultant manfacturer, Mr. Merriman called on his past experiences to reveal how an object proceeds from invention to marketable item. He illustrated his points by showing various tools he had developed.

—John F. Morris

SYRACUSE CLAMBAKE—August 21 found a crowd of 673 members and guests of the Syracuse chapter enjoying activities at the annual clambake. A variety of events was on the program, with games, including the session pictured above, getting lots of attention. Prizes were presented to all winners. —*Andrew A. Lachner*

Long Island Members Learn About Silicones

"Silicones" was the subject of a talk given by George A Congdon for the 75 members of Long Island chapter who met at the Garden City Hotel on September 13. Mr. Congdon is technical representative of Dow-Corning Corp., New York City. He also showed a sound color film entitled "What's a Silicone?" —*Jerome Barfus*

IBM Engineer Discusses Materials Handling

Binghamton ASTE members met at Vestal American Legion hall on September 8 to hear a talk by George A. Smith, materials handling engineer for the International Business Machine Corp., Endicott, N. Y. Mr. Smith, a past national president of the American Materials Handling Society, told how proper materials handling results in the saving of time and money.

Slides showed practical applications, contrasting projects with and without the assignment of materials handling groups. The technical program attracted an audience of 55 members and guests. —*Paul J. Adamek*

C. Russell Frain Dies

C. Russell Frain, 53, of New Holland, Pa., died of a heart attack at his home on September 20. He was engineering cost analysis supervisor for the New Holland Machine Co. Previously he had been assistant superintendent of the North Plant of Posey Iron Works in Lancaster. He was a member of the Greater Lancaster chapter.

—*G. E. Gallagher*

Los Alamos Members Hear Victor Meyers

When the Los Alamos chapter met at the Little Theater on September 15, Victor Meyers was the guest speaker. Mr. Meyers, Albuquerque representative of Consolidated Engineering Corp., Los Angeles, spoke on "Vibration Measurement Techniques." He told how to trace tool failure, select speeds and feeds for maximum production and to check the efficiency of fixtures and dies while in use.

A motion picture was also shown which depicted the advance of measuring techniques in all fields of manufacture and illustrated the growing need of dynamic measurement in research, development and product design of the complex mechanisms of today and the future. —*Basil Boss*

PHILADELPHIA PROGRAM—Anthony A. Zamis, chief engineer for the tool and machine division of Illinois Tool Works, spoke on the production and design of gears for critical applications. Pictured with him is Chairman Ed Hollingshead. —*Edgar Harrop, Jr.*

Racine Chapter Holds "Get Acquainted" Night

Pre-meeting activities for Racine chapter's opening session of the year were devoted to "Meet Your Fellow ASTE Member." Chairman Morrie Otto urged everyone to make a special effort to mix with the new members and meet men from firms other than their own. Seventy members were present for the dinner and program held at the Racine Manufacturers Association.

The chapter's 1954 scholarship winner, Donald Bohn, was introduced and presented a check for $100. Mr. Bohn is planning to attend Marquette University at Milwaukee.

The technical talk was given by C. J. Kremer, field engineer, Micro-Switch Division of Minneapolis Honeywell Regulator Co., Freeport, Ill. After covering a brief history of the firm and a description of its products, Mr. Kremer showed a film on the uses of the Micro Switch. —*Alvin J. Michna*

St. Louis Chapter Holds Suppliers Program

St. Louis chapter utilized both the 15th and 16th floors of the DeSoto Hotel when they held annual suppliers night. It was the opening meeting of the fall season and 22 distributors and manufacturers of machinery and industrial equipment participated by setting up booths and displaying new and unusual products. Members had ample opportunity to get firsthand information on products of their interest.

P. C. Bossmeyer, designer and promoter of optical tooling equipment, gave an interesting talk on "Optical Tooling" prior to the viewing of displays. Nearly 200 were on hand for the annual event. —*Bert Igou*

Erie Chapter Tours Cleveland Plant

Members of the Erie chapter traveled to Cleveland on September 25 to tour Barth Corp. They were warmly welcomed to the plant by Thomas Barth and Pat Taverna. After a brief film on "Automation," the members were divided into small groups and escorted through the plant.

A buffet luncheon climaxed the tour after which the group proceeded to Cleveland Municipal Stadium to see the Cleveland Indians and the Detroit Tigers in action. After the ballgame, Erie members enjoyed a supper at Smith's Restaurant in Euclid, Ohio.

—*Samuel A. Fiorenzo*

Simplifying Tool Design Discussed by Executive

A discussion on "Application of Work Simplification Principles to Tool Design" was given before the Niagara District chapter at its September meeting. Technical speaker was W. K. Hodson, Pittsburgh manufacturing executive. His points for work simplification included: eliminating all unnecessary operations; combining operations wherever possible; and changing the sequence of operations.

More than 80 members and guests attended the program held at Queenway Hotel at St. Catharines. C. R. Mitchell presided as chairman.

—William Yaeger

Cushman Chuck Co. Appoints W. H. Jones

W. H. Jones, a member of ASTE's Philadelphia chapter, has been appointed representative for the Cushman Chuck Co., Hartford, Conn., in southern New Jersey, Delaware and Virginia. He has been associated with the Lovejoy Tool Co. as a representative in this territory for ten years.

Albuquerque Meeting Devoted to Vibration

Vibration, its detection and control, was the topic under discussion at the September 14 meeting of the Albuquerque chapter at the Desert Inn. Speaker was Victor Myers, field engineer for CEC, Inc., a subsidiary of Consolidated Engineering Co., Los Angeles, Calif. Slides of oscilloscopes and graphs were shown demonstrating their use in detecting unharnessed vibrations.

Ralph Chrissie of the National Program Committee was a special guest at the meeting and spoke on the forthcoming 1955 ASTE Western Exposition to be held in Los Angeles.

——Herbert E. Anderson

C. L. Jones Named Master Mechanic

Appointment of Clayton L. Jones as master mechanic is announced by M. V. Durkin, vice president-manufacturing of Morse Chain Co. of Detroit, a Borg-Warner industry. Mr. Jones, whose headquarters will be the company's main office in Detroit, was formerly vice president of manufacturing for Hage Industrial Corp., Toledo, and a master mechanic and superintendent for the Bradford Machine Co. of Cincinnati. He is a member of the Toledo ASTE chapter.

LONG BEACH SPEAKER—William D. Peters, right, manager of the West Coast Division of Denison Engineering Co., Columbus, Ohio, was the guest speaker at the September 8 meeting of Long Beach chapter. His topic was "Design Principles of High Pressure Hydraulic Pumps." Chairman C. B. Edson thanks him.

—C. W. Ward

San Gabriel Valley Holds Dinner Dance

Pamona Country Club was the scene and September 17 the date for San Gabriel Valley's annual dinner dance. The event was enjoyed by 210 persons.

Two weeks earlier, on September 1, the chapter met at Azusa for a program on automatic tube bending presented by Art Thomas, head of the Arthur Thomas Machinery Co., Los Angeles. About 85 members were present to learn about specialized tube bending tooling.

—J. S. Wajdik

Hartford Officer Writes Article on ASTE

Written by P. Erick Dillberg, an article on tool engineering and the objectives of the Society appears in the September issue of *Connecticut Industry*. The magazine is published by the Manufacturers' Association of Connecticut, Inc.

Mr. Dillberg's discussion emphasizes the important contributions being made by the tool engineer to the American standard of living and national security. He outlines the national programs of ASTE as well as the many state activities supported in Connecticut.

—A. Douglas Proctor

Warren D. Getchell Speaks at Lima Meeting

The Royal Pine Room was the scene of the Lima chapter's September 16 meeting, and the guest speaker was Warren D. Getchell, chief field engineer of the McCrosky Tool Corp., Meadville, Pa. His talk on "America—Freedom of Travel" was augmented by colored slides which he had taken on his wide travels.

Special guests at the meeting were: J. J. Fox of Baldwin-Lima-Hamilton in Lima; Henry H. Crodian, Crodian Co., Indianapolis, Ind.; W. J. Witte of the A. M. Schmidt Co., Toledo, Ohio; Russ Dresher of Superior Tube, Wapakoneta, Ohio; and W. E. Thomas of National Seal, Van Wert, Ohio.

—Donald Cox

LIMA CHAPTER MEETING—Pictured at the September meeting of the Lima chapter are: from left, Gene Siferd, program chairman; H. W. Carey, first vice chairman; and Warren D. Getchell, chief field engineer for the McCrosky Tool Corp., Meadville, Pa., who was the guest speaker for the evening program.

Springfield Chapter Holds Tool Seminar

On September 14, 85 members and guests of the Springfield, Ohio, chapter had dinner at the Rustic Inn and adjourned to hold the technical session at the Steel Products Engineering Co. in Springfield.

W. R. Alexander, assistant chief tool engineer at the company, addressed the group on the design, development and manufacturing of all types of bevel gears. Also on the technical program was a talk by Charles Brehm, inventor of the Brehm Shimmey Die, the Brehm Trimming Die, and the Brehm Trimming Press and Tube Trimmer. He gave a detailed explanation of the principles and fundamentals of all.

The group was then taken to the shop to witness all the machines and tools in the discussion in action.

—Roger Horstman

Ralph Cross Discusses Capital Expenditures

Ralph E. Cross, executive vice president of The Cross Co., Detroit, Mich., was the technical speaker at the September 9 meeting of the Cedar Rapids chapter. The topic for his talk was "How to Get the Most out of Capital Expenditures."

Investment in appropriate capital equipment and modernization at the right time are two important factors which determine the success of an investment program, he said. The best decisions along these lines, according to Mr. Cross, are usually made by someone who can devote all of his time to studying old and new methods of manufacturing.

—Robert J. Bloch

Worcester Members Hear Clifford T. Appleton

Clifford T. Appleton, vice president of Reed Rolled Thread Die Co., Holden, Mass., was the guest speaker at the Worcester chapter's September 7 meeting.

Talking on the topic "Thread and Form Rolling," Mr. Appleton covered principles, development and applications of the process. He discussed equipment and tool use for producing rolled threads, rollability of materials, preferred forms of rolling and blank specifications.

Also on the agenda was a plant visitation of the Reed Rolled Thread Die Co. under the direction of John Baskis.

—John C. Lalor

ROCHESTER SPEAKER—A token of appreciation is presented to Speaker Frank Rives of General Electric, right, by Chairman Jerry Sick at the Rochester chapter's September meeting.

Frank Rives Speaks on Automation at Rochester

Frank Rives, specialist at General Electric Co., Schenectady, N. Y., was the guest speaker at the September 13 meeting of the Rochester chapter. Mr. Rives showed movies and spoke on "Automation and the Automatic Factory" to the group of 200 members and guests who met at Barnard Firemen's Exempt Club.

The chapter announced that it has increased its annual scholarship appropriation from $400 to $800 for study at Rochester Institute of Technology. The scholarships are granted to Monroe County high school graduates on the basis of scholastic records, entrance exams and personal interviews.

—Paul A. Bruno

Lloyd Dunbaugh Dies

Lloyd F. Dunbaugh, 47, senior member of the Louis Joliet ASTE chapter, died on June 21. He was carrying on his duties as factory superintendent of the Caterpillar Tractor Co., Joliet, Ill., when he passed away. Mr. Dunbaugh came to the Joliet plant in 1952 after serving ten years as general foreman at the Peoria plant.

W. R. Rudolph Joins Bay State Abrasive Co.

A member of the St. Louis ASTE chapter, William R. Rudolph has been appointed abrasive engineer for Bay State Abrasive Products Co., Westboro, Mass., according to an announcement by Elden L. Auker, sales manager. Assigned to the Missouri, Kansas and southern Illinois area, his headquarters will be located in Chicago. He was formerly president of the Robert Rudolph Tool Co. in St. Louis.

Elox Representative Speaker at Hamilton

When 87 members of the Hamilton District chapter met at the Brant Hotel, Brantford, on September 1[illegible], the guest speaker was H. V. Harding. Mr. Harding is technical assistant to the president, Elox Corp., Clawson, Mich.

As the topic of his talk he chose "Electrical Discharge Machining," a process which he said would remove metal to very close limits and give a fine finish, despite the fact that a tool never touches the work.

Mr. Harding described a fully automatic electrical discharge method of drilling, broaching, reaming, die sinking and grinding any known metal. He was introduced by Bill Dawson and thanked on behalf of the chapter by Clarence Bulmer.

—G. W. Haukes

Tulsa Chapter Sponsors Tool Engineering Courses

A class in shop mathematics and another in practical tool design are being sponsored and taught this autumn by members of the Tulsa ASTE chapter. The mathematics course, offered at Will Rogers High School, covers practical measurements, ratio and proportion and shop trigonometry.

Students in the design class meet at the University of Tulsa for their work in detailing of working tools, jig and fixture dimensioning, practical aspects with regard to quantity and economy under varying conditions, and classification of work.

The courses were planned and organized by the chapter education committee.

Detroit Member Forms Company at Plymouth

John Haller of the Detroit chapter, formerly vice president in charge of research and engineering at Allied Products Corp., Detroit, has organized his own firm, Haller Inc., at Plymouth, Mich. The company will handle sales and engineering connected with hydraulic and mechanical presses.

New Post for Garrison

Ranald M. Garrison, member of the Chicago ASTE chapter, has been named manager of manufacturing at Hanson-Van Winkle-Munning Co., Matawan, N. J. Prior to naval service during World War II, Mr. Garrison worked as chief engineer and plant manager for an oilfield equipment company.

Peterboro Members Visit Roller Bearing Factory

Members of the Peterboro chapter enjoyed a plant tour on September 9. Object of their attention was the S.K.F. Ball and Roller Bearing Factory, Scarboro, Ont. Approximately 70 members were conducted through the plant and later saw a film entitled "Production of Steel for Bearings." Lunch and refreshments were served.

—Donald G. Moorby

"Carol" Wreaks Havoc for Little Rhody Meeting

Candlelight and lack of air conditioning greeted the nine members and guest speaker at Little Rhody's September 2 meeting at Johnson's Hummocks. The inconvenience was caused by "Hurricane Carol," tempestuous maiden who had visited the Atlantic coast two days before.

There was to have been a plant tour at the Mason Can Co. in East Providence, R. I., but the hurricane put a crimp in that plan. Instead, George Bachman, personnel manager of Mason Can, as guest speaker talked informally to the members present about the effect of the storm on his company.

—Richard Kilbane

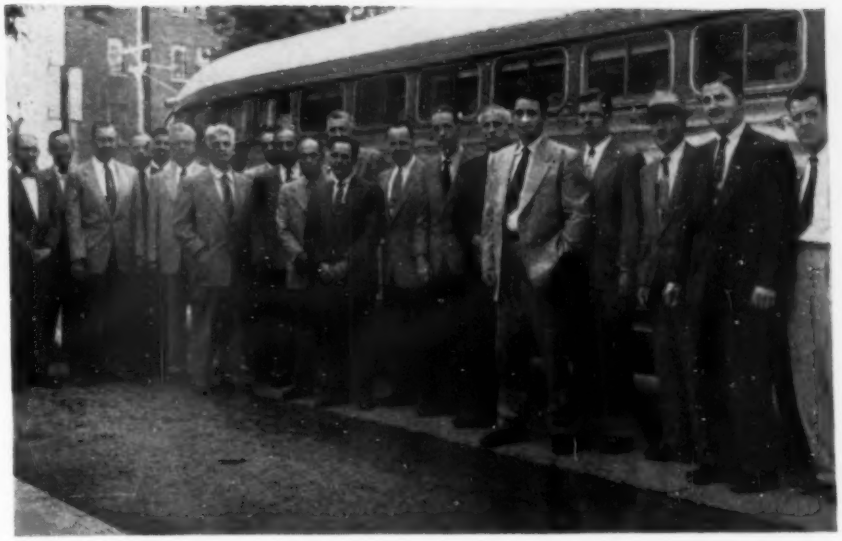
Robert Groman Discusses Welding Developments

Robert Groman and Cliff Berglund

Speaking before 110 members of the Louis Joliet chapter, Robert H. Groman of the Eutectic Welding Alloys Corp. told of new developments in the welding of tools and dies. The meeting was held September 21 at the Woodruff Hotel.

Chapter Chairman Burdett introduced new members who were presented with ASTE membership pins. Ernie Egger was given special recognition for his work with the standards committee in the development of improved manufacturing methods.

—Lionell Rohman



FORT WAYNE PLANT TOUR—Members of the Fort Wayne chapter paused a moment to have their picture taken before boarding a bus which will take them on a tour of Continental Can Co., in Elmwood, Indiana. The tour was arranged by Dave A. Chambers, industrial relations chairman of the chapter.—*Robert H. Bienz*

Horton Co. Names General Sales Manager

George S. Chiaramonte of the Hartford chapter has been appointed to the newly-created position of general sales manager of The E. Horton & Son Co., Windsor Locks, Conn., according to an announcement by R. S. Cooper, president of the firm. Mr. Chiaramonte moves up from the post of sales manager of the Horton Chuck Division.

Kennametal Movie Shown at Portland Meeting

Portland, Maine, ASTE members viewed a film on trends in carbide tooling at their September 10 meeting. Produced for Kennametal, Inc., the movie showed ten jobs being machined with mechanically held carbide tools, emphasizing the advantages of toolholders.

Speakers at the meeting were Robert S. Sagers and Henry Worthington, both of Kennametal, who conducted a question and answer period. The meeting was held at the Graymore Hotel.

—Henry P. Hagman

Named Sales Representative

Virgil Fortner, a member of the Louis Joliet chapter, has been appointed exclusive representative in the Chicago area for the Gorham Tool Co. of Detroit, according to a recent announcement by George N. Popham, vice president.

Sheffield Representative Guest of Madison Chapter

Madison chapter held its first fall meeting on September 16 at the Eagles Clubhouse, Madison, where Louis Reichbauer of The Sheffield Corp., Dayton, Ohio, was the guest speaker. His talk touched on air devices and controls, including Plunjet Air gaging, how it works and what it does.

During the business meeting James Gage announced the start of a refresher course at the University of Wisconsin for professional engineering.

Guests from Sheffield included John McCoy and John Toobey, sales representatives for the corporation.

—L. A. Havey

Houston Chapter Tours American Can Company

A tour of American Can Company's Houston Division, "Canco," was on the agenda recently for Houston chapter. Some 160 members were on hand for the event.

Members were welcomed to the plant by W. S. Puffer, plant manager. Guides took groups through the various steps of manufacturing process where 55 million cans are made per month.

Facilities viewed were: the press line where blanks are made, the assembly and coating machines, tool and die shop, steam generation plant, laboratory, warehouse and packaging department.

—A. F. Huge

coming ASTE meetings

ANN ARBOR AREA—Nov. 10. "Gadgets Night." Speaker Ralph Eshelman, associate editor of THE TOOL ENGINEER.

COLUMBUS—Nov. 10. "Personnel, Administration and Labor Relations" by a representative of Brown and Sharpe.

DAYTON—Nov. 5. "Civilization through Tools" by a representative of Do All.

DENVER—Nov. 11, 6:30 p.m., Cunningham's Restaurant. "Optical Tooling Problems" by a representative of Engis Equipment.

ELMIRA—Nov. 1, 7 p.m., Mark Twain Hotel. "Automation" by Charles Hautau, president of Hautau Engineering Co., Detroit.

FORT WAYNE—Nov. 10. "Rezolin Plastics" by a representative of Modern Pattern Works, Toledo, Ohio.

GRANITE STATE—Nov. 16. Somersworth Hotel. "Automaticity" by Sanders Associates.

HAMILTON DISTRICT—Nov. 12. Tour of McKinnon Industries, Ltd., New Motor Plant, St. Catherines, Ont.

HARTFORD—Nov. 1. Lecture on tools and dies with a panel discussion.

HENDRICK HUDSON—Nov. 17. "Standardization of Engineering Materials" by Captain Reamy, USN.

INDIANAPOLIS — Nov. 4. Executives nnight. Speaker is L. R. Baker, director, Chrysler Institute of Engineering.

LEHIGH VALLEY—Nov. 19, 8 p.m., Hotel Traylor, Allentown, Pa. "Drills and Taps" by Arthur Jameson of Union Twist Drill Co.

LIMA—Nov. 18, 6:30 p.m. "What's a Silicone" by R. E. Vidal, sales engineer, Dow-Corning Corp., Cleveland.

LITTLE RHODY—Nov. 4, 6 p.m., Johnson's Hummocks. General discussion of lathes by Stanley Brandenburg, vice-president in charge of sales, Monarch Machine Tool Co., Sydney, Ohio.

LONDON-ST. THOMAS—Nov. 18. General discussion of the work carried on in the engineering department of Ontario Research Foundation by O. W. Ellis.

LONG ISLAND—Nov. 8, 8:30 p.m., Garden City Hotel, Garden City, N. Y. "The Cavitron or Supersonic Method of Drilling and Machining Hard Materials" by George Brown of The Sheffield Corp., Dayton, Ohio.

LOUIS JOLIET—Nov. 6, 6:30 p.m., Cantigny Post. Ladies' Night. Nov. 16, 6:30 p.m., Cantigny Post. Annual management night with coffee speaker Joseph P. Crosby, national president of ASTE. Also "Electronics—Uses Unlimited" by H. E. Hawkins, field engineer, Minneapolis Honeywell.

NEW HAVEN—Nov. 11, Hotel Garde. "Cost Reduction through Use of Air Power Bellows."

NORTHERN MASSACHUSETTS—Nov. 16, Colonial Hotel, Gardner, Mass. "Fluid Power in Action" by H. L. Stewart, assistant sales manager in charge of all special engineering, Logansport Machine Co., Logansport, Ind.

NORTHERN NEW JERSEY—Nov. 19, 6 p.m., F. Blanchett Co., Clifton, N. J. "Modern Measuring Devices" by Fay Aller, director of research, The Sheffield Corp., Dayton, Ohio.

PHILADELPHIA — Nov. 18, 6:15 p.m., Engineers Club of Philadelphia. "Measuring in Millionths" by Frank Clark of The Van Keuren Co.

PITTSBURGH—Nov. 5, Ford Motor Co. "Automation" by Gilbert F. Murie, supervisor of mechanical design, Ford Motor Co.

ROCHESTER — Nov. 1. Joint meeting with National Tool and Die Manufacturers Association. Panel discussion on tool, dies, jigs and fixtures by Rochester chapter members. Special guests include Joseph P. Crosby, national president of ASTE, and National Director Willis G. Ehrhardt.

ROCKFORD—Nov. 11, 7 p.m., Lafayette Hotel, Rockford. "Ultrasonic Machining of Hard Metals" by J. T. Welch, manager of Ultrasonic Machine Tool Division of The Sheffield Corp.

SAGINAW VALLEY—Nov. 11. Ternstedt plant tour.

SAN FERNANDO VALLEY—Nov. 3, 7 p.m., Hody's Restaurant, North Hollywood, Calif. "Metal Adhesives—Their Uses and Tooling" by W. D. Rainey, technical sales manager, Narmco Resins and Coating Co., Costa Mesa, Calif.

SAN GABRIEL VALLEY—Nov. 4, Rainbow Angling Club, Azusa, Calif. "Eutectic Welding" by a representative of Eutectic Welding Alloys Corp.

SOUTHEASTERN MASSACHUSETTS — Nov. 16, in Brockton, Mass. Executives night. "Atomic Energy in Industry" by Carrol L. Wilson, vice-president and general manager of Metals & Controls Corp.

TOLEDO—Nov. 10. "Design and Maintenance of Small Dies" by Edward Stouten of Capitol Engineering Co.

TRI-CITIES—Nov. 10, 6:30 p.m., Rock Island Arsenal. "Plastics" by a representative of Renite Co.

TWIN CITIES—Nov. 3, Covered Wagon. Past chairmen's night. "Roll Forming" by Elmer J. Vanderploeg of Yoder Roll Co., Cleveland.

WESTERN MICHIGAN'S OPENING MEETING—The fall season was started off with a ladies night program for the Western Michigan chapter. It was held at the Blythefield Country Club and more than 150 attended the event.

PROGRESS in production

FIND WAY TO TURN PLASTIC AT HIGH SPEED

Plastic it has been found may be machined by methods usually applied to most light metals. Yet high-speed turning with solid centers has caused a smoky or fogged discoloration to the plastic's finish.

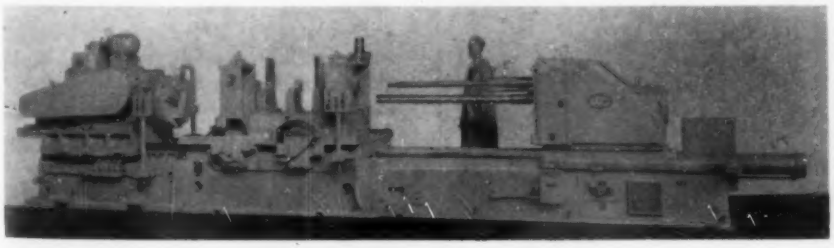
Now results of study by the Ready Tool Co. indicates that this unacceptable condition can be avoided if an anti friction center is substituted for a solid center for high-speed work. The friction center is designed to take the excessive speed without diminishing the tolerances or precision characteristics of plastics. By putting special emphasis on bearing construction, Red-E engineers have made continued cool running possible. Two single row bearings are clamped together to form a duplex, angular-contact, preloaded precision bearing. In addition, they provided a short overhang to allow work close to the tailstock.

At right, an operator is threading polyvinyl chloride stock as a simple operation in a metalworking shop. Metalworkers find plastics can be generally worked with more ease and precision than many metals.

Results of the new approach are indicated in the photo where polyvinyl chloride stock is being threaded with no discoloring effect on the material.

DOES BORING AND FACING AS SINGLE JOB

Simultaneous cam and crank finish boring and facing operations are done with the Borefacing machine designed by the National Automatic Tool Co., Inc. The unit, which employs two heads, not only speeds up production, but accomplishes work at 85-percent efficiency, completing 4.3 parts per hour. Work is on diesel engine blocks. The right-hand head finish bores seven in line main bearings, oil retainer and cover, four (in line) camshaft bearing inserts and two holes. At the same time, the left hand head rough, semi-finish and finish bores and cross-feed faces the flywheel housing and cover.



SIMPLIFIED WORK— BETTER EFFICIENCY

Proof of how simplification can improve economy of operation and increase efficiency has been demonstrated at Spicer Mfg. Div. of Dana Corp. A saving of $100-thousand in a single year was accomplished simply through changing sequence of certain job operations, standardizing and simplifying tooling and also synchronizing it with existing production needs. Actually the changes occurred in several production areas but a fair example is the tooling changes accomplished for the machining of 12 specific gears of similar design.

Originally an 8-station vertical spindle machine to drill, turn, face, bore and ream the gears was tooled for

removal, matching and replacing of backing plates, tool blocks and tool bits. This involved six designs of backing plates, 12 designs of tool blocks, two drill brackets, two boring bar brackets and a reamer bracket. To further complicate the tooling, the backing plates had either vertical or horizontal T-slots for attaching tool blocks. Adjustment was limited to one direction. An angular slot corresponding with the cutting angle of the tool bit was required in the tool blocks.

Now the revised tooling is simplified and its application is easier. The same 12 gears are machined on the same 8-spindle machine with this tooling: two backing plates, two drill brackets, one reamer bracket and one tool block. The plates, blocks and bits require no matching or removal from the machine for adjustment. Radial T-slots in the backing plates permit tool block mounting at any angle. The boring bar is attached to the backing plate in the same way as the tool block.

Resultant advantages from this reconsideration of operation has been increased per-employee production, reduced setup time, decreased tool maintenance and reduced production cost. In this case production is in relatively small quantities, which automatically dictates frequent setup changes. Therefore the advantages were particularly noticeable.

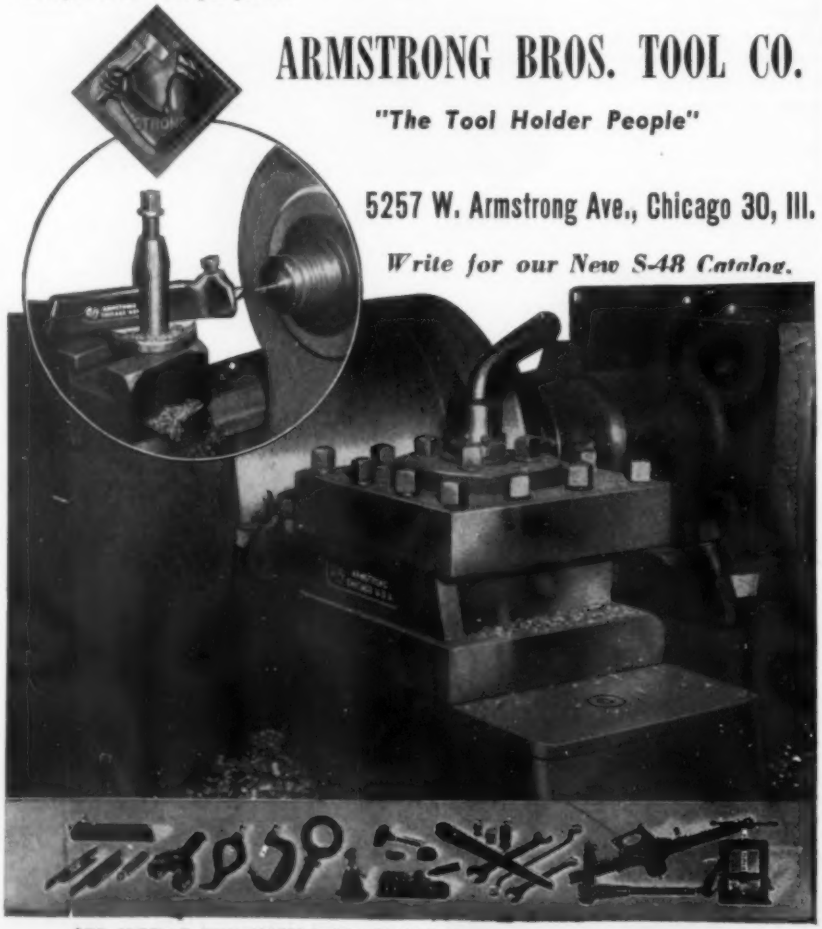
ARMSTRONG
TOOL HOLDERS

for every operation!

There are ARMSTRONG TOOL HOLDERS in sizes and types for every operation on lathes, planers, slotters and shapers—for the heaviest cuts; for the most delicate cuts.

With Standard shaped cutters, bits and blades of ARMSTRONG HIGH SPEED, ARMALOY (Cast Alloy) and ARMIDE (Carbide-Tipped) they provide a system of tooling that assures maximum production per machine hour, lower tool costs, and higher machining profits.

These permanent multi-purpose tools can be picked up as needed from your industrial distributor. Use them wherever possible to increase number of pieces per hour, to lower cost per pieces.



ARMSTRONG BROS. TOOL CO.

"The Tool Holder People"

5257 W. Armstrong Ave., Chicago 30, Ill.

Write for our New S-48 Catalog.

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SIMPLIFIED WELDING FOR NOW-AND-THEN USERS

Small shops with only occasional need of quick, easy methods of repair or fabrication maintenance will find ready use for a welding method developed by The Lincoln Electric Co. The technique, called Selfweld, has several attractions. It requires little skill, so is usable by everyone; it is fast, and it consistently achieves satisfactory joints. Work is done with a 100-amp welding machine

specially designed by Lincoln, that employs both a special welding electrode and a special electrode holder.

An average workman, using the simplified welding device, needs no knowledge of professional technique since he does not even touch his work during this process. Note the operator in the photograph is simply following progress of the weld.

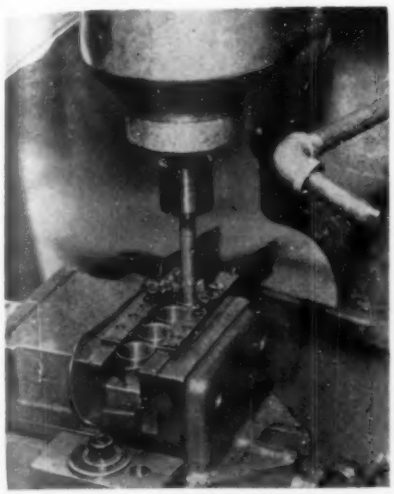
To accomplish the work, the tip of the electrode simply is held against the metals to be joined at the point where the weld begins. Merely pressing a switch on the holder fires the electrode which automatically makes the weld itself as the tip is held against the metal. Thus, the electrode and holder accomplish the work normally done by the welder.

Design of the electrode and holder automatically controls the beginning of the weld, starting the arc, feeding the electrode, the electrode angle, and the travel speed. The coating of the electrode touches the work at all times so that the arc length is automatically decreed. Melt-off rate determines welding speed.

STEEL CHIP REMOVAL ON PRODUCTION SCALE

Vacuum brushing has been utilized to whisk out tiny steel chips from deep in the threads of stainless steel coupling nuts and at the same time have removed a long-time production and assembly problem.

Work is done with small sturdy wire brushes made by Osborn Mfg. Co. The brushes are mounted on a tapping machine. Nuts, which are of various sizes, are hand fed into a specially built



fixture. The brush, with 0.005 stainless steel wire fill, is driven down into the nut at 100 fpm, reversed, and brought out at 200 fpm, having removed both chips and burrs. As the brush lifts clear, another nut is inserted at the front of the fixture forcing the completed one from the fixture and down an improvised chute.

The operation is fast, accurate and always complete. It replaces a hand cleaning method with obvious advantages.

FAST ANGLE DRESSING FOR GRINDING WHEELS

Any angle desired can be achieved with accuracy and efficiency when dressing grinding wheels with the innovation devised at Temco Aircraft Corp. A Hardinge lathe compound, or head, was adapted by mounting it between centers on cylindrical, thread or surface grinders, to do the dressing.

Although the thread grinders at Temco have automatic provisions for dressing grinding wheels to 15 or 30 deg angles, any other degree of angle had to be dressed by hand—a time consuming, often inaccurate, operation. An adjustable wheel dresser was devised by grinder-operator Harold E. Hall which incorporates a Hardinge compound with an attached degree

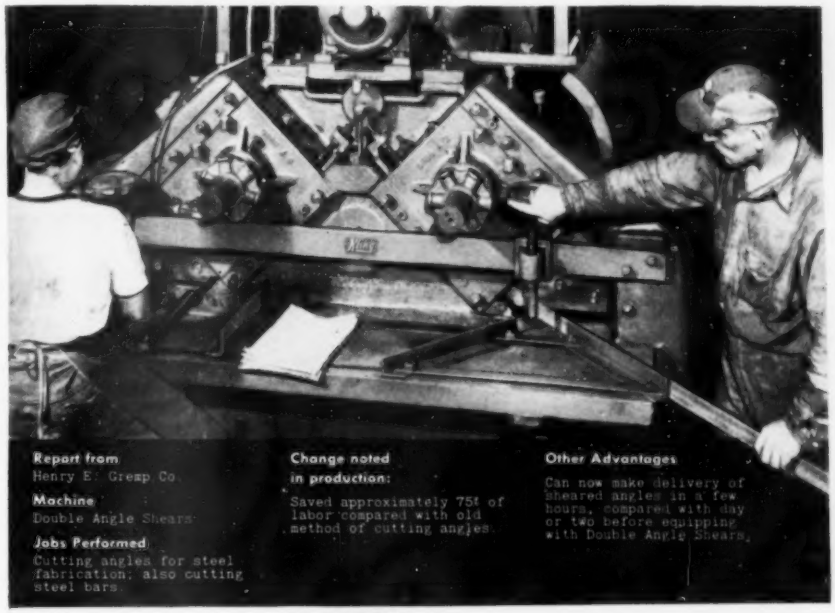
Here the grinding wheel dresser is mounted between centers on an Ex-Cel-O thread-grinder.

marker, mounted on a small steel block with a T-bolt slot. When the compound is mounted between centers on a grinder, the zero point on the degree marker is opposite the edge of the grinding wheel and perpendicular to its axis. The diamond-holder on the compound can be swiveled, lined up and locked at any of the 360-deg marks on the degree-marker.

In addition to the grinding versatility the device has given to conventional machines, wheel-dressing time has been reduced by two hours a week.

CUT LABOR COST 75%

. . . now do in HOURS, what formerly took DAYS!


Report from
Henry E. Gremp Co.
Machine
Double Angle Shears
Jobs Performed
Cutting angles for steel fabrication; also cutting steel bars
Change noted in production:
Saved approximately 75% of labor compared with old method of cutting angles.
Other Advantages
Can now make delivery of sheared angles in a few hours, compared with day or two before equipping with Double Angle Shears.

Kling DOUBLE ANGLE SHEARS

cut production costs in the **"BEST OF COMPANIES"!**

This is the latest equipment for fast, production shearing of all kinds . . . actually two shears in one machine . . . can handle several jobs at one time. For instance, as shown in the illustration above, the Kling Double Angle Shears at the Henry Gremp plant in Chicago, cut angles for steel fabrication on one side and cut steel bars on the other. Flats, angles or rounds all look alike to this "workhorse". If you have considerable mitre shearing, Kling Double Angle Shears can be mounted on a turntable to facilitate handling. Automatic hold-downs and one-shot lubrication can be furnished if desired. Sizes to handle angles up to 8" x 8" x 1½".

Following are a few of the companies using Kling Double Angle Shears:

Auto Specialties Mfg. Co., Elizabeth Iron Works, Henry E. Gremp Co., Union Iron & Steel Co., International Steel Co., Link Belt Company, Joseph T. Ryerson & Co., Morris Wheeler & Company, Unit Steel Corporation

Write for free Bulletin that tells you in detail exactly how Double Angle Shears work and what they can do in your shop to save you time and money.

KLING BROS. ENGINEERING WORKS • 1320 North Kostner Avenue, Chicago 51, Illinois

Since 1892

Kling ***...an investment in speed!*** 704-TE

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TOOLS of today

Shell Core Machine

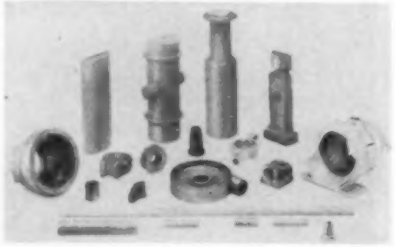
What is considered the first machine for commercial production of shell cores for use with green sand, permanent and shell molds has been developed by Shalco Engineering Corp., Palo Alto, Calif. Its production speed is estimated at one completely cured shell core in from 30 to 50 seconds depending upon core size and wall thickness. Multiple cavity boxes permit even higher production.

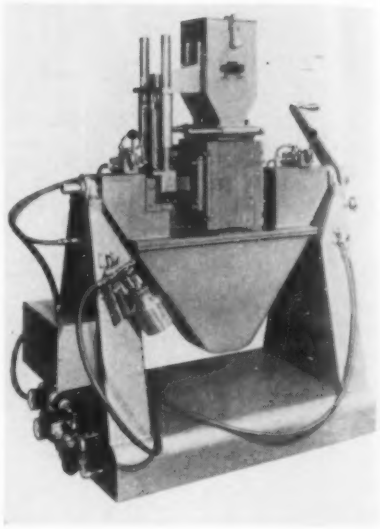
The machine is available for gravity investment with sand hopper and shutter, or it may be had for blown cores with a blow head. Built-in heater plates in the shell core machine permit the curing process to be completed in the machine itself without need for core dryers and ovens. A thermostat and magnetic contactor automatically controls the core box temperature.

The operating cycle is very simple and requires a minimum of operator effort. **T-11-1521**

Right. Complete shell core making machine. Note handle at far right which can be turned to invert the machine.

Below. Display of forms possible with the shell-making unit.





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Automatic Lathe for High Production

Automation, maximum carbide performance, high rates of metal removal, and automatic chip removal are characteristics of the line of automatic lathes designed by Hydra-Feed Machine Tool Corp., South Norwalk, Conn.

On interest in the operation of these high production commercial units is that direction of rotation is reversed from normal practice. This has made possible the elimination of the usual tooling from the front of the machines —resulting in an unobstructed loading area.

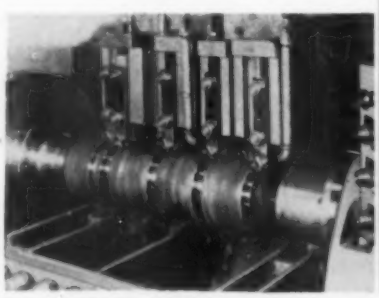
Reversing the rotation also has resulted in other advantages. Tool pressures on rear tools are downward instead of upward as on conventional automatics. This means full advantage is taken of the massive and rigid bases of the machines to provide smooth, powerful cutting at high speeds. Combined cutting speeds and feeds give metal removal rates as high as 52 lb per minute.

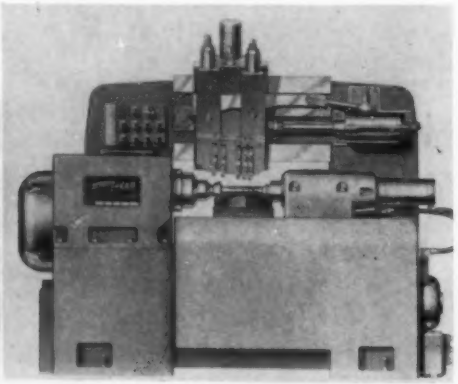
As a further advantage resulting from reversed rotation and a cleared front carriage, chip flow is unobstructed through the full width, full depth chip chute provided.

Avoidance of a chip removal problem is especially important in view of the machine's high metal removal rates.

Four models are available. Indicative of metal removal rate is the power for which the machines are designed. On the Model HD-8 lathe (illustrated) a motor of 30 hp at 1800 rpm is recommended for the spindle and main drive. The lathe calls for a 100-hp motor. Proportionate motor sizes are provided for on the Model HD-12 and Model

Right. Model HD-8 Hydra-Feed lathe. Below. Close-up view shows multiple carbide tool contour tool turning.





HD-2 inch lathes.

Spindle speeds are infinitely variable and range from 82 to 2400 rpm on the Model HD-8, from 98 to 1475 on the Model HD-12 and from 66 to 1072 rpm on the larger models.

Other advantages growing out of the open design and high performance characteristics of the unit are reduced loading time, easier setup and reduced operator fatigue.

Hydraulically operated carriages and slides may be set to perform automatically practically any combination or sequences of operations. Each carriage or slide may be operated independently, however, through selector switches and pushbuttons on the single central control panel.

Automatic multiple cycling is provided for on these machines when desired, permitting consecutive roughing and finishing of parts in the same setup and the same tooling without stopping the machine. **T-11-1531**

Electronic Control

A multiple synchro element which can serve as a shaft position data transmitter or receiver of exceptional accuracy, has been developed by Farrand Optical Co., Inc., under an Air Force contract.

Only three inches in diameter, and little more than 3½ in. in length, the device is designed to achieve by electronic means, an angular accuracy equal to that of a precision mechanical

dividing head or rotary table three to six times its size.

Applications include use in machine tools as a back-lash-free gear ratio, in precision dividing heads and in gear cutting machinery.

The unit, known as the Inductosyn, can be used as an electronic automatic machine tool control capable of automatically positioning the carriage of a machine tool with a maximum linear error of 0.0001 inch and positioning a rotational member with a maximum angular error of 5 seconds of arc.

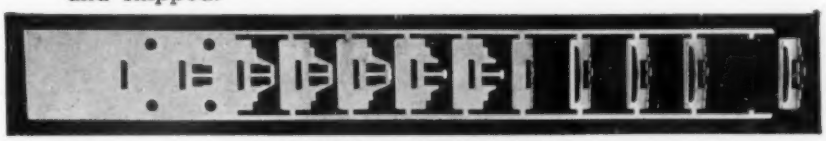
Used as a distance measuring device,

B. Jahn DIES PRODUCE

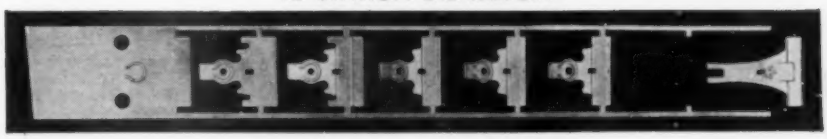
Every Metal Component of the Eversharp Hydro-Magic Razor!

TO LESS THAN WHISKER-THIN TOLERANCES . . . WITH "PRODUCTION PROVED" PERFORMANCE AND ECONOMY!

Eversharp-Schick specified dies to mass produce a razor of superior quality . . . flawless operation . . . competitive price. Working against a tight schedule, B. Jahn evolved a series of progressive dies that turned out each individual metal component used in the razor! Every close tolerance was faithfully met — all specifications of die performance were adhered to — every requirement of product quality and accuracy was engineered and built into the dies by B. Jahn. To guarantee customer satisfaction, components were submitted to Eversharp-Schick for actual assembly line use before the dies were certified "PRODUCTION PROVED" and shipped!



12 STATION DIE RIBBON



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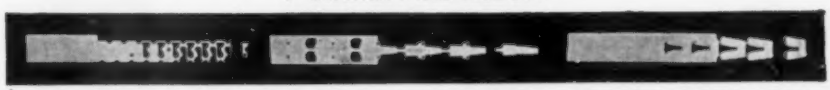

5 STATION DIE RIBBON 3 STATION DIE RIBBON 3 STATION DIE RIBBON

Send today for the fact-packed, picture story of "B. Jahn Production Proved Dies!"

B. Jahn

THE B. JAHN MANUFACTURING COMPANY, NEW BRITAIN, CONNECTICUT

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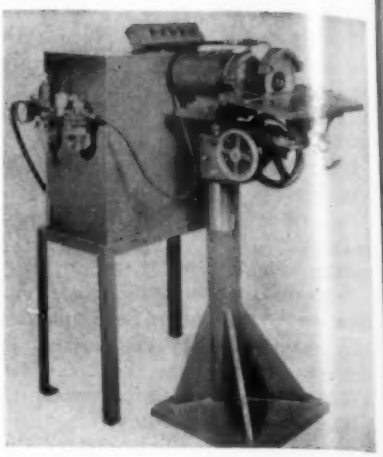
it is capable of measuring distances of hundreds of inches with an accuracy of a fraction of a thousandth of an inch.

Various typical uses of the Inductosyn might be as an electromechanical dividing head; a seventy-two speed data transmission system; a high-speed electromechanical phase shifter; an angular pickoff with an accuracy to five parts per million; or as a low inertia speed changer.

Further information is available from the company, Bronx Blvd. and E. 238th St., New York, N. Y. **T-11-1541**

H-S Carbide Grinder

Operation at 10,800 rpm is accomplished with the high-velocity, single-point carbide tool grinder, called the HI-V developed jointly by Ohio Metal Working Products, Cleveland, Ohio and the Metalloid Corp., Huntington, Ind. The machine, which is said to be the first to utilize high velocities for practical production tool grinding, combines customary rough and finish grinds into one high-speed operation. The result is a cu-in. rate of carbide removal as much as five times greater than expected by conventional methods. Use of the ultra high speed with a nickel bond diamond wheel and a special fluid to limit energy absorption in the wheel applies approximately 95 percent of the total energy developed to the carbide tool face. As a result, the wheel functions with a minimum of wear without raising the internal energy of the matrix.



The HI-V grinder utilizes an all-metallic grinding wheel to which diamonds are bonded by pure nickel electrolytically deposited.

The HI-V grinder employs an integral direct-drive motor and special precision spindle with high-speed bearings. The motor spindle provides two speeds of rotation with both right and left-hand use. High-speed operation at 10,800 rpm and a low speed of 3600 rpm are accomplished by means of a frequency converter. The unit's controls are pushbutton operated and include a master start and stop button and one for each operating speed in either direction of rotation. An electro-dynamic brake can halt the spindle within two seconds. **T-11-1542**

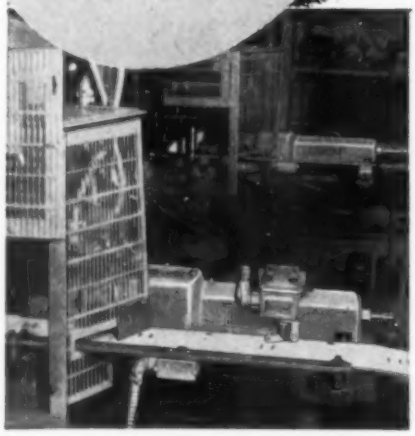
Small Parts Finishing

Precision deburring and finishing of small intricate parts, short runs or sample lots was the primary purpose for which the Mity-Mite Jr. Deluxe, a small size barrel finishing unit was designed by Speed-D-Burr Div. of Miller Machine Tool and Gauge Shop, 3613 San Fernando Rd., Glendale 4, Calif.

The small barrel finisher is designed as a cabinet style unit and comes complete with ⅓-hp motor, 110v, single phase and 8 feet of cord. Octagonal barrell is 8 x 8 inches in size, neoprene-rubber lined with quick acting clamps on access door. It requires a floor space only 18 x 20 inches; over-all height is 36 inches. **T-11-1543**

Polaroid Corp. reports . . .

26,000 HOURS OF PRECISION PRODUCTION to date



FROM DICKERMAN ROL-DI-FEEDS!

GRUELING PRODUCTION MARATHON DEMONSTRATES DICKERMAN DEPENDABILITY AND ACCURACY!

3 years of unfailing service — 24 hours per day — with no overhaul or appreciable maintenance — is the phenomenal record established by Dickerman Rol-Di-Feeds in the Sun Shield Department of the Polaroid Corp. More than 70,200,000 pieces have been produced . . . the original feeds are still in daily operation and . . . are expected to outlast the die itself.

Feeding .030" polarizing lens stock at 30-60 strokes per minute (depending on requirements) the Rol-Di-Feed activates optically perfect material that must be fed and blanked to micro-tolerances without the slightest trace of scratching or marring.

Dickerman

H. E. DICKERMAN MFG. CO.

324-225 Albany Street • Springfield, Mass.

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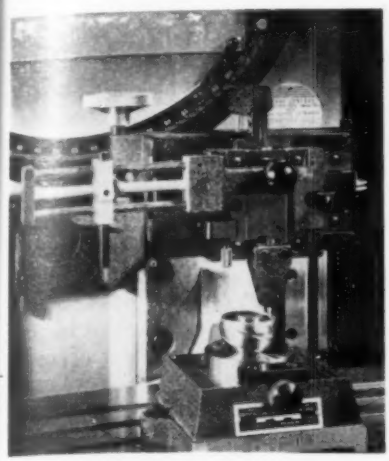
Con[illegible]ur Tracer

A [illegible] to extend versatility of optical proje[illegible]n gaging has been introduced by O[illegible]cal Gaging Products Inc., 26 Forbe[illegible]St., Rochester, N. Y.

Ide[illegible]fied as the Coordinate Tracer, Mode[illegible]4, it is standard accessory and



is designed to be used particularly in gaging difficult interior dimensions or unusual contours. In use, the tool tracing arm of the tool is so arranged that the tip of its tracing "finger" touches the piece to be gaged. As the contours are traced, the tracing motion is transmitted to a target in the light beam of a projector. **T-11-1551**

USE READER SERVICE CARD ON PAGE 167 TO REQUEST ADDITIONAL TOOLS OF TODAY INFORMATION

Balancing Machines

Development of a line of horizontal static-dynamic balancing machines has been announced by the Tinius Olsen Testing Machine Co. Operation is by means of the highly sensitive Electrodyne electronic indicating system, which automatically shows up unbal-

NEW LINCOLN PLANT CREATED BY INCENTIVE-INSPIRED CO-ACTION IN DEVELOPING POSSIBILITIES IN PRODUCT

LINCOLN AUTOMATIC WELDING

...Simplifies fabrication of cylindrical shells

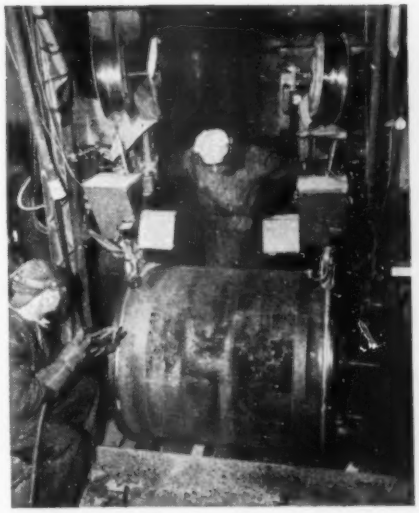


Fig. 1. *Two Lincoln fully automatic heads simultaneously make external welds joining cylindrical shells to end flanges, using L-60 5/32" electrode wire. Four passes fill the groove.*

Fig. 2. *A Lincoln hidden arc welder, mounted on a boom, produces an internal circumferential weld fastening flange to the shell which is automatically rotated.*

Cost-Cutting Automatic Lincolnweld as shown in Figure 1 simplifies difficult fabrication of 39½" cylindrical shells rolled from 1½" steel in this New York welding shop. External and internal welding of 2½" ring flanges is done with Lincoln semi-automatic welding heads. The unusual longitudinal and girth joints call for high current density and deep penetration. These Lincoln welds actually meet specifications more stringent than in Par. U-68 of the A.S.M.E. Code.

A Lincoln specialist in automatic welding will gladly show you how to adapt Lincolnweld to *your* production machinery to cut costs. If you wish, he will work with your equipment builder for maximum production efficiency.

For complete facts on Lincoln low cost automatic welding, write on your letterhead for Bulletin 439-2.

THE LINCOLN ELECTRIC COMPANY

Dept. 5006, Cleveland 17, Ohio

THE WORLD'S LARGEST MANUFACTURER OF ARC WELDING EQUIPMENT

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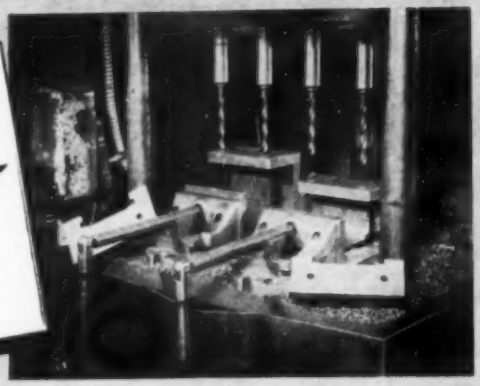
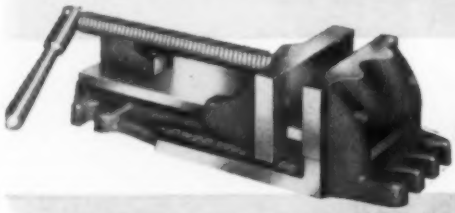
Here's PROOF that
~~SPEED VISE~~
is a fast
production tool



Here's a production set-up on a multiple spindle semi-automatic drilling machine that is really cutting manufacturing time and costs. The use of two Speed Vises eliminates the need for expensive and complicated fixtures and at the same time increases the production range. With Speed Vise it is only necessary to make a simple jaw plate to fit the parts being machined and to hold drill bushings, etc.

★ Quick action design for speed. Opens instantly to full capacity to handle work of any size.
★ Standardized holes for attaching jigs or jaw plates.
★ Lift...slide...lock...that's all there is to the fast, positive locking action.
★ Heavy, semi-steel castings for extra strength and a heavy base plate for rigidity.



Write now for Bulletin 30-AM

CARDINAL MACHINE COMPANY

1819 Dana Street, Glendale, California

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BRAND NEW
ANGULAR-BASE
DE-STA-CO TOGGLE CLAMP

with low silhouette
the fixture-hugger
that makes it far
easier to insert and
remove work . . .

and complete clearance
of working area due
to flop-over holding
bar—ideal for
positioning metal
or plastic sheets!

Send for
FREE CATALOG
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DE-STA-CO
Models 507 and 509

DE-STA-CO DETROIT STAMPING COMPANY
World's FIRST line of TOGGLE CLAMPS
328 Midland Avenue • Detroit 3, Michigan

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ance for the selected plane of correction. Angle and amount of unbalance are clearly indicated on two large meters mounted in the face of the control panel. The plane of correction is changed quickly with the pivot shifter which assures positive plane separation.

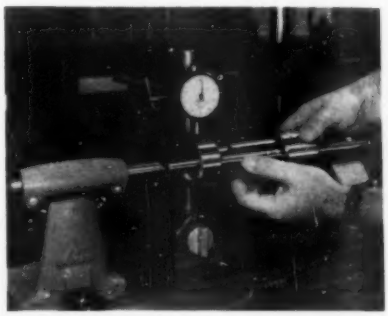
Calibration of the indicating system can be checked or changed at any time simply with a screw driver. Full scale on the amount meter can be set to indicate any amount of unbalance.

Detailed information is given in Bulletin 49 available from the company's Balancing Dept., 4106 Easton Rd., Willow Grove, Pa. **T-11-1561**

Expanding Mandrel

Accuracy and concentricity within 0.0002 in. total indicator reading is possible with the type "S" super Count-Centric added to the line of universal expanding mandrels made by The Le Count Tool Works, Inc., 390 Capitol Ave., Hartford, Conn.

The new mandrel is particularly



adapted to the finish grinding, superfinishing, inspecting and other operations requiring extra precision.

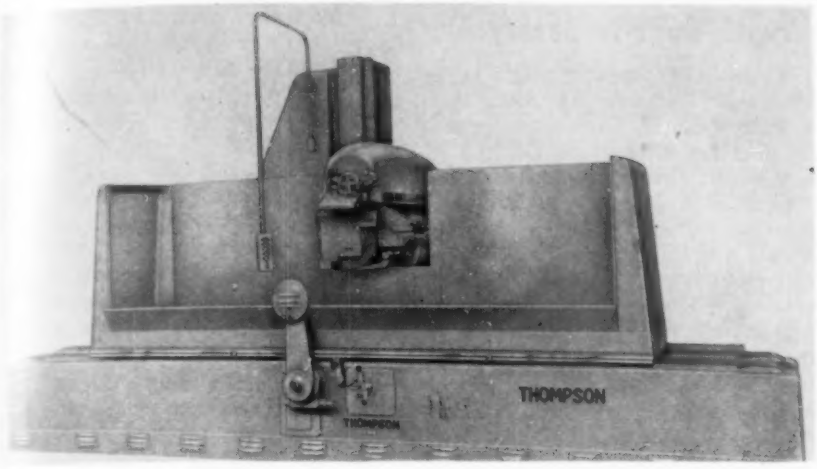
The Model S is similar in design and construction to the Model A introduced a year earlier. Both types are well suited for maintenance applications in a broad variety of fields, since they provide a wide range of accurate arbors without the need for big inventory.

T-11-1562

Extra Heavy Duty Surface Grinders

Extra power and precision for heavy-duty production are offered in the Type CX hydraulic surface grinders introduced by Thompson Grinder Co., Springfield, Ohio. The massively constructed unit provides rapid removal of stock while maintaining close limits and fine finish.

Among features incorporated in the design are the cross feeding wheelhead with horizontal spindle grinding with



Multi-Purpose Work Holder

A basic tool versatile enough to be used in place of multiple special fixtures has been introduced by Lassy Tool Co., Plainville, Conn. It utilizes standard interchangeable jaws and clamps for holding single or multiple pieces either of odd or regular shape.

Accessories for the fixture include counter balance weights, drill bushing plate, riser blocks work stops for single or multiple pieces and extension work stop sleeves. Long work is accommodated because of a through hole in the base. Pieces which vary as much

the periphery of a 20-inch diameter wheel and the rapid and accurate positioning of wheel to work. For better maintenance, it permits "in position" wheel truing. It is made in a full range of sizes from 30 x 26 x 72 inches to 36 x 36 x 24 inches (or larger).

In addition, a wide range of auxiliary equipment is available for the CX.

The machine illustrated is equipped with auxiliary raised elevation attachment and swinging pushbutton station. The size is 36 x 48 x 120 inches. Table speeds, as in all Thompson CX's are 10 to 100 fpm with vertical feed handwheel graduated to 0.0005 and powered at 15 ipm; cross feed handwheel is graduated to 0.001 with power 1/32 to 3 inches. Hydraulic wheel truing is 6 ipm and hydraulic rapid traverse at 240 ipm. Grinding wheel speed is 6,000 fpm.

T-11-1571

Copper-coated Welding Rod

Strong (48,000 psi, tensile) machinable welds, free of blow holes, are easily accomplished by the average torch welder with a copper-coated iron welding rod compounded by All-State Welding Alloys Co., Inc., 249-55 Ferris Ave., White Plains, N. Y.

This rod has a lower working temperature (1400 vs 1500F) and requires less preheat (600-800 vs 600-1000) than the rod it will replace in the All-State line. According to the makers, the new rod flows out better, makes a denser deposit, is more easily machined, color matches, and it develops a Brinell hardness of 170-200. Copper coating prevents rusting, common to cast iron rods, and accounts for the flow characteristics.

Identified as All-State No. 3 general purpose cast iron rod, this new product is available in 3/16 and 1/4-inch diameters. Rod length is 18 inches. **T-11-1572**

Now—Lock Your Feed Rates to Protect Machines . . . Reduce Costs with the CROSS Flow Control Lock!

Only authorized personnel carry a key for the Cross Flow Control Lock! They set machine feed rate, then lock it.

Easy to install. Just remove valve nameplate and adjusting lever, reinstall over lock mounting plate.

Available for Vickers 1/4" flow control valves and remote control panels.

For full details, write Dept. A211.

- Eliminates Tampering
- Stops Costly Shutdowns
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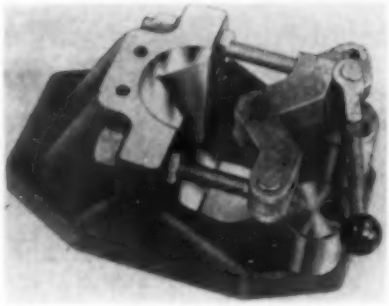


as 1/32 in size may be held with equal pressure due to compensating clamps for this multiple holding. The clamps are positive and have no springs.

Even when tools are subjected to machining vibrations or fast rotation, positive clamping is maintained since the cam is nested into the adjustable swing clamp. **T-11-1581**

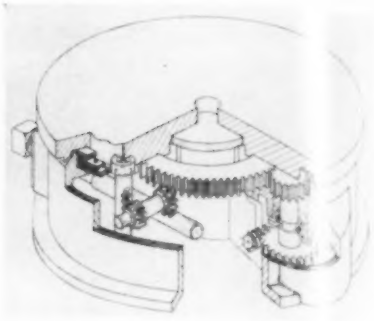
Index Tables with Built-In Safety

Hydraulically operated index tables with safety features that make them virtually foolproof have been designed by Michigan Drill Head Co., 971 E. 8 Mile Rd., Detroit 34, Mich.

Location is positive from a tapered shot bolt. The shot bolt is operated from a hydraulic cylinder with a pressure relief valve to control the amount of pressure applied to the bolt.

If any operating part engages the fixture, while the table is operating, the table will stop automatically. The oil in the fluid-drive motor will not drive the table when it meets any resistance.

Design of the table is very simple—merely a worm and a worm gear. The large gear is driven from a point near the outside diameter of the table.



The driving load is controlled from the fastest point on the table. A decelerating valve shuts off the oil supply just before the shot bolt is placed in the cut, assuring smooth operation. Gradual closing of the oil supply prevents any shock to the shot bolt.

The oil for operating the table can be taken from any other hydraulic source you may have on your machine. This is possible because the feeding units are stationary when indexing.

Four sizes of the table are available: 20, 30, 42 and 60 inches. They can be bored for any number of stations, ranging from two to fifteen. **T-11-1582**

USE READER SERVICE CARD ON PAGE 167 TO REQUEST ADDITIONAL TOOLS OF TODAY INFORMATION

Adjustable Gages for Bores

Simplification and cost reduction are the major advances offered users of bore gaging equipment with development of its adjustable boregages by the M. C. Hutto Co., 6516 Detroit Ave.,

Cleveland 2, Ohio. Fifteen sizes are available for measuring holes from 0.995 to 6.005 inches.

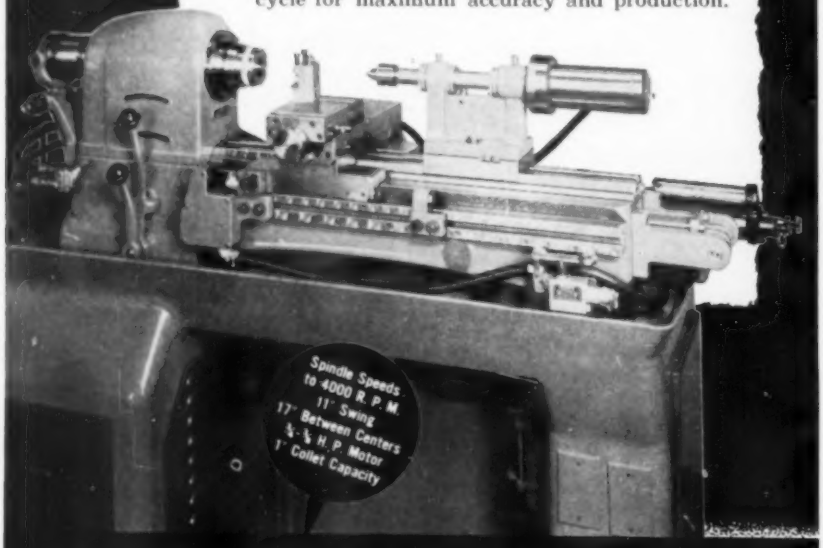
The tool consists of a light pencil-size handle connected by adapters to fixed adjustable torque-design gages at each end. One gage is set to "go", the other to "not-go" dimension. This double end gage has removable washers for recording dimensions to which gages

ELGIN PRECISION
for more than 50 years

Automatic Production Air Feed Lathes

TURNING • FACING • BORING

The Elgin High Production Air Feed Lathe is a new design, resulting from many years of experience in the precision machinery field. Its outstanding features are, High Precision, Efficiency, Simple Operation, Rigid Construction. The carriage is pneumatically—hydraulically powered in an automatic cycle for maximum accuracy and production.



ELGIN TOOL WORKS, Inc.

1773 Berteau Avenue, Chicago 13, Illinois

FOR FURTHER INFORMATION, USE READER SERVICE CARD; INDICATE A-11-158

set. Both color and physical differ- are used to identify each end.

ch gage has a single micrometer- adjusting screw and a lock screw passes through a tension nut pro- g controlled pressure between the gage components, making it simple et and positively lock the gage to ired size. If desired, both adjusting w and lock screw can be sealed. adjustable boregages can be set h ordinary measuring devices.

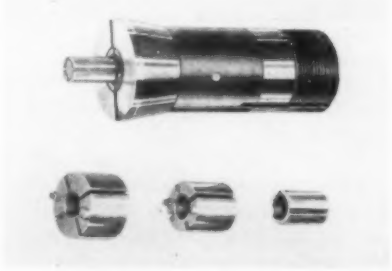
In use, when a hole is within toler- e, the "go" gage rocks freely with- forcing and the "not-go" gage binds. any other result is obtained in gag- g, the hole is not within tolerances.

Design of the gage affords instant ry into bore; detects bellmouth, taper, out of round; avoids questionable tolerances. **T-11-1591**

Internal-Holding Collet Arbor

An expanding type collet arbor made by The Medelton Co., Inc., 335 East 142nd St., Bronx 54, N. Y., holds work parts internally to achieve precision concentricity of any secondary or final facing, turning, machining or grinding operation.

Entire length of a part may be finish machined due to internal holding in the bore of the part. Accurate linear holding means the face of a part may be held and machined exactly square to



the bore. Since the collet does not change position when it expands, length of the machined part can be held to tenths consistently.

Used in place of the standard collet, this collet arbor, called the Hole-True, is actuated by the drawbar of the machine. No other parts are needed. When used with a production collet attachment, work may be loaded and removed from a lathe without stopping the spindle.

The set consists of a master collet arbor of $\frac{3}{8}$-inch diameter and three hardened and ground adapter bushings to hold work with bores of $\frac{1}{2}$, $\frac{3}{4}$ and 1 inch. **T-11-1592**

Internal Measuring

Engis Equipment Co., 431 S. Dearborn St., Chicago, Ill. offers a Micro-Maag internal micrometer for checking the dimensional accuracy of bores. With their use exact hole size of a bore can be determined as well as the amount of stock to be removed. The instrument may be used effectively for high precision inspection of any diameter from $\frac{1}{4}$ to 8 in. The micrometer itself has 0.00005 in. divisions. The device is being displayed for the first time at the Metal Show. **T-11-1593**

Coolant Application

Just placed on the market is a Mel-O-Flo coolant aerator which offers an unusual method of applying coolant to machine tools. It connects directly to the coolant line and mixes atmospheric air with coolant to form a non-splash aerated mixture that clings to work and tools and reduces centrifugal "throw-off." By providing a better wetting action heat dissipation is accelerated, giving better cooling, longer tool life. A simple self-cleaning mechanism flushes the aerator of chips and

Add as many spindles as you want—and multiply your savings—with this combination designed for economical production drilling. You will note, as indicated by the drawing and photos, that you may combine *any number of Table Sections* to accommodate just the right number of 20" LIGHT-HEAVYWEIGHT Drill Press Spindles to fit the specific jobs you have to do.

This LIGHT-HEAVYWEIGHT combination gives you the maximum in flexibility and economy. The number of intermediate Table Sections determines the number of Spindles which can be varied to fit the nature of your work and output requirements. Best of all, you avoid the heavy expenditure for costly, specialized equipment.

Ask your Distributor to demonstrate the performance advantages of Walker-Turner LIGHT-HEAVYWEIGHT 20" Drill Press units. He has them in stock as Bench Models and Floor Models, and can specify Multi-spindle Models with exactly the number of drill heads you need.

Walker-Turner LIGHT-HEAVYWEIGHT
20" Multi-spindle Drill Press
(Six Table Sections—12 Drilling Units)

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• DIVISION •
KEARNEY AND TRECKER CORPORATION
PLAINFIELD, N. J.

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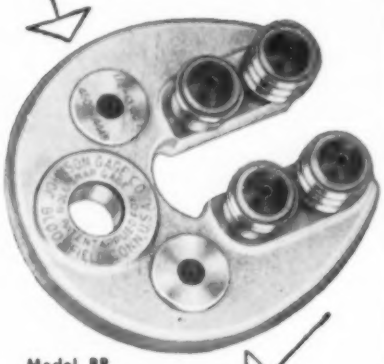
JOHNSON'S new ROLL-Snap THREAD Gage



Model RR

for the utmost in

- ECONOMY
- FLEXIBILITY
- SPEED
- SIMPLICITY

Here is the finest designed ROLL-Snap Gage on today's market. Its huskier, simplified construction actually *lowers* its production cost which means lower prices to you.

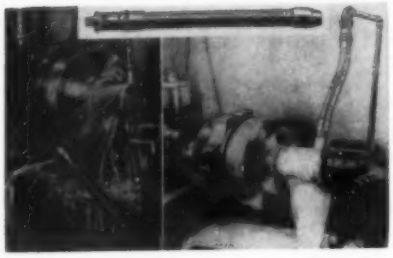
Incorporates such exclusive features as precision ground working surfaces on frame . . . all frames, rolls and studs interchangeable . . . Go rolls have restricted end play to detect "drunken" threads . . . Not Go rolls, cone and vee type, correct for Pitch Diameter check . . . lapped steel washers to assure permanent alignment and rigidity of studs. Roll guards optional.

Where more exacting control and information is required, Johnson RING-Snap thread gages or ROLL-Snap and RING-Snap Comparators, Analyzers, and Standard Accessories are recommended.

NEW illustrated literature explaining how to get maximum thread control at lowest costs is yours for the asking (Specify Form C-RR-54)

Johnson Gage

THE JOHNSON GAGE COMPANY
BLOOMFIELD, CONN. U.S.A.
INDICATE A-11-160



sludge whenever the coolant supply is turned off and on, permitting uninterrupted machining. The device may be used on any manual or automatic machine tool for all types of operations on all metals. Its use requires neither compressed air line or special plumbing equipment. **T-11-1601**

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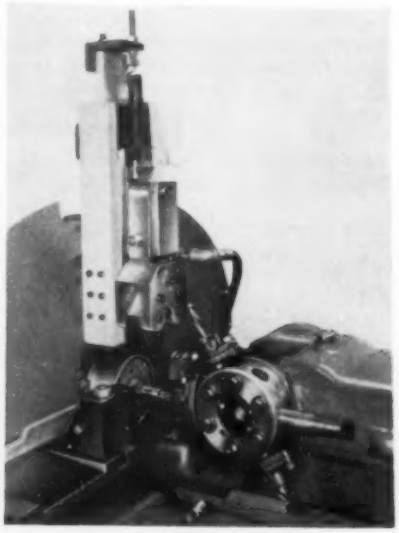
Top Slide

A heavy duty top slide, designed to hold Salvo thread rolling attachments, has now been placed on the market by Salvo Tool & Engineering Co., 26441 Gratiot, Roseville, Mich. The slide was designed for use in the top position of Brown and Sharpe No. 2G, OG and OO automatic screw machines. The unit may be installed in any of these automatics without altering the machine.

Operation is by a standard cut-off cam, and both advance to the feed position and return are rapid.

The slide offers a five-inch stroke which allows ample clearance under the thread rolling attachment for cross slide tools, and which can be used for forming, shaving, cross drilling and milling. A positive return cam avoids the possibility of the slide sticking on center and causing tool breakage.

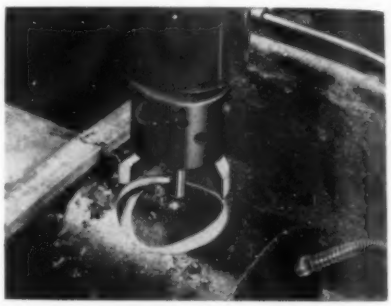
T-11-1602



Hole Cutting Tool

An unusual tool designed for hole-making operations has been announced by Robert H. Clark Co., Beverly Hills, Calif. Known as the Clark Hole Maker, it can be used on steel, cast iron, aluminum and its many alloys and other common metals, producing clean, true holes in all thicknesses between heavy plate and skin-type materials. It may be successfully applied to cylindrical or crowned shapes, while high efficiency is assured by grinding correct clearance angles on bits and using proper cutting speeds and feeds for the various metals. On turret lathes and chucking machines the Hole-Maker rapidly cleans up cored holes in castings, bores through webbed sections and flashings in forgings.

Its three-bladed design permits at least one bit to remain in constant contact with the work, even on curved surfaces, which means smooth cutting action and freedom from grabbing on intermittent cuts. The Hole-Maker also makes possible easy size control. Each bit is adjustable within its tool slot. This means quickly compensating for



wear besides permitting considerable variation in hole sizes produced with a single model.

Smooth performance results from a conically shaped centerpiece produced by the bits. Cutting edges of each blade are the inside vertical faces. Since the bits surround the cone and are in contact along the full cone height, a three-point bearing occurs between cutters and cone. This bearing not only centers the tool, guiding and stabilizing the cut, but cutting forces are equalized between each bit, producing smooth, chatterfree action. Outer tips of the bits establish bore size, cut through smoothly without ragged breakouts.

A removable pilot in the tool may be replaced with a pilot drill. Use of the drill in the Hole-Maker speeds operations on variable speed radial drills by eliminating a separate drilling operation for the pilot hole.

Five sizes of Hole-Makers are now manufactured covering diameters from 1 to 6 inches. **T-11-1602**

Wheel Belt Grinder

A production increase of 20 percent or more over old grinding methods is claimed by B & E Mfg. Co., Inc., 407 Liberty St., Kansas City, Mo., through its recently introduced Model 500 contact wheel belt grinder. Offering both flexibility and maneuverability, it can be mounted on a bench, pillar, portable

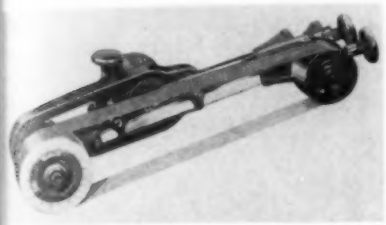
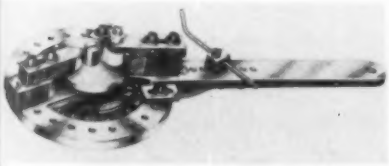


table or other convenient place in the shop. An adjustment of 360 deg vertically is one of its special design features. It is also instantly adjustable to the most advantageous point for visual and physical comfort of the operator.

The grinder speeds up production on deburring, chamfering, removing flash, fins, parting lines, etc. in industries, doing free hand grinding. It may be used for finishing steel, cast iron, bronze, aluminum, wood and plastic. **T-11-1611**

Metal Forming Machine

The Curvette, a hand operated metal forming machine, has been placed on the market by Lund Products Div. of Artys Sales Co., 11 Broadway, New York, N.Y. Primary job of the simple-to-operate machine is to perform individual bending jobs or short production runs. Its simplicity offers a particular

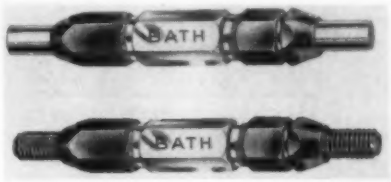


advantage where samples, maintenance pieces or individual jobs are most frequently run, because it is easy to reset or change over from one bending job to another.

Where practical, two Curvettes can be used as a double bending machine for two simultaneous forming operations. The units will form basic wire up to ¼ in. diameter and multiples in smaller sizes, strip metal up to ¾ by ⅛ in. and thin-walled tubing to ⅜ in. diameter. Special feature of the unit is an attachment for coiling, curving and ringforming of wire and tubing. **T-11-1612**

Long-Life Reversible Gages

John Bath & Co., Inc., 20 Grafton St., Worcester 8, Mass., has added a line of thread and cylindrical reversible gages that the manufacturer suggests



will accomplish up to 50-percent cut in gaging costs. These gages, made from selected steel, are adjustable for use as depth gages and have go and not go color identification. **T-11-1613**

Water Soluble Die Lubricant

A drawing compound which is water miscible in ratios ranging from equal parts to 1 to 15 parts, and which embodies an exclusive dispersant additive insuring against caking on dies and knock-out or stripper mechanisms, is being introduced by the Texas Co. at the National Metal Exposition and Congress.

The product is a mixture of mineral oil, emulsifying agents, nonabrasive pigment, and a dispersion additive. Primarily it was developed to handle work being processed under difficult forming conditions. It is easily removed by water washing.

Results of laboratory and field tests

by the builders of the famous

TWIN WHEEL TOOL GRINDER

Built-in characteristics of STANDARD Spindles:

- Built for Longer Life
- Precision Tolerances
- Extra Heavy Duty

Why settle for less?
Write for details today.

Standardize with
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PRECISION SPINDLES • MACHINE TOOLS
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indicate that the drawing compound contributes materially to longer die life, increased output per hour, and lower unit manufacturing costs.

Its properties permit a versatility of application. It can be cut back to fit a great range of operating conditions; it is easy to apply to the work; and it has no objectionable odor.

The properties of the new compound facilitate an even flow of metal during forming. Since metal to metal contact is prevented, die galling or sticking, and seizure are therefore virtually eliminated.

Extended periods of operation without time lost for reconditioning of equipment are promoted by the new product. Its specially developed soft filler contributes to efficient operation because it contains no abrasive material to scratch the blank punch or the die.

T-11-1621

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Miller with Mobile Head

An unusual concept in universal milling machines is featured in the Gambin F27 milling machine.

Primarily this machine differs from the conventional univeral head type in that the Gambin head may be set in three planes. Not only does it swivel and tilt, but the entire spindle assembly and arm slides. This mobility permits

the milling cutters to be positioned at any angle as well as at variable distances from the frame.

Since the head is an integral part of the machine, the unit is very rigid and the full 8 hp of the spindle motor is delivered to the cutters.

Other features of the machine include graduation of optical gages in 0.005 in.; 40 speeds, 22-2000 rpm; 36 feeds, ½ to 28 ipm; as well as controls accessible from all sides of the machine.

The machine is being distributed in this country by Permasco, Div. of Winter, Wolff & Co., Inc., 76 Beaver St., New York 5, N. Y. and at 1206 South Maple Ave., Los Angeles 15, Calif.

T-11-1622

Tool Control

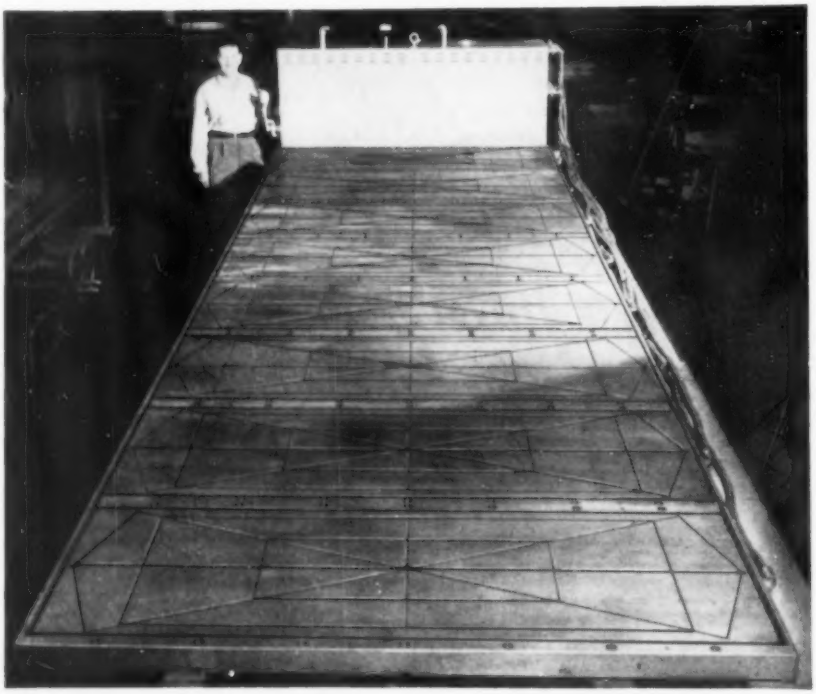
A tool control unit for all types of metalworking equipment has been announced by The Cross Co., Dept. 22P, Detroit 7, Mich. It offers advantages of reduced tool costs, decreased sharpening expense and increased machine efficiency.

The unit is available in four different sizes with one, two, four or eight Toolometers.

Pointer on the Toolometer is set at a point representing the expected output of pieces per tool sharpening. Indexing with each machine cycle, it automatically shuts down the machine for a tool change when the zero mark is reached.

A red area on the meter shows last useful period of tool life. Thus, in instances where a tool control unit

Walker Does It Again-



Walker, pioneer in the chuck industry, has been utilizing magnetic force to make all types of special and standard chucks since 1887.

Walker now harnesses atmospheric force for special vacuum chucks to hold non-magnetic materials. First a leader in magnetic force—now a pioneer in atmospheric force.

Hold Everything with Walker Chucks

O. S. WALKER CO. Inc.

WORCESTER 6, MASSACHUSETTS

Original Designers and Builders of Magnetic Chucks

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with more than one Toolometer is used, the operator replaces all tools which are indicated to be in their danger zone when the Toolometer stops the machine for a specific change.

This grouping of tool changes reduces downtime and increases production. Scrap loss is lower because use of dull tools is eliminated **T-11-1631**

Electronic Timer

Ferrara, Inc., announces a precision general purpose electronic timer with 1-percent accuracy for interval timing, timed delay, repeat cycling, programming or pulsing.

Because of its unusual circuit design this timer, the Model T2, maintains that accuracy over line voltage variations of 90-135 volts.

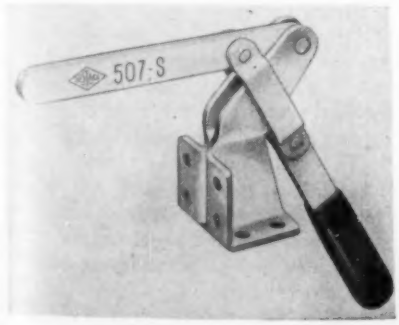
Its features include three time ranges of 0.1-1 sec., 1-10 sec., 10-100 sec., a direct reading time dial, two SPDT load contacts with 8-ampere rating.

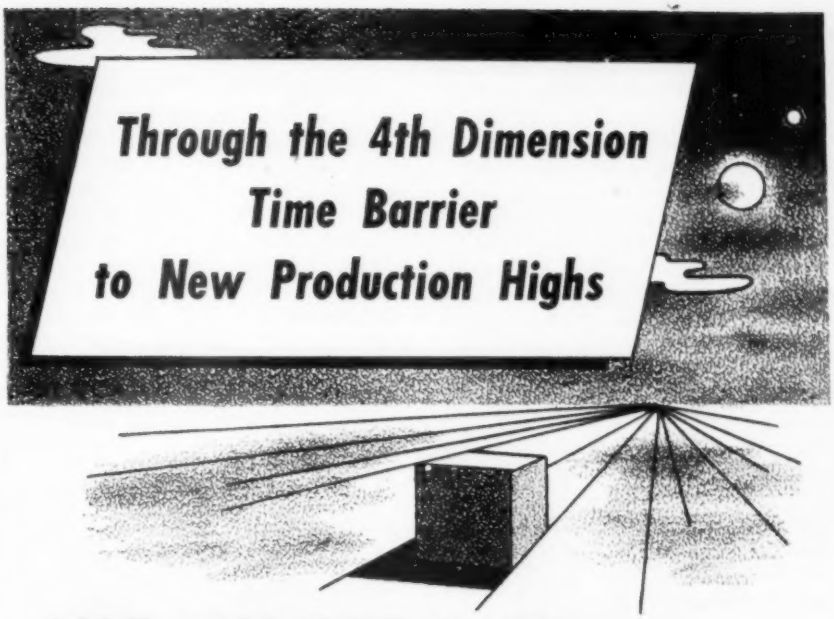
A technical brochure on the timer may be obtained from the manufacturer, Dept. E-5, 8106 W. Nine Mile Rd., Oak Park 37, Mich. **T-11-1632**

Toggle Clamps

Low silhouette and complete clearance are important features of the Model 507 toggle clamps recently introduced by Detroit Stamping Co., 350 Midland Ave., Detroit, Mich.

Design of the clamp makes it lie snug to the fixture when holding, yet stay entirely away from the working surface when hold of the spindle and holding bar is freed. This low silhouette and





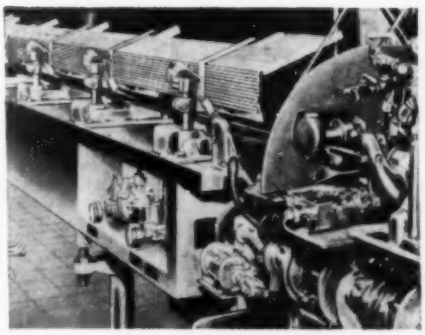
LIPE AML BAR FEED

gears machine production to the steady flow of Time

ALL industrial results are achieved in Time . . . *vital 4th dimension that measures output, costs, profit.* Shorten the time gap between operations . . . shorten the time when machines are "cutting air" . . . keep machines producing at a steady optimum rate during the fatigue slow-down from 10:30 to noon, and from 3 P.M., till closing time . . . *and you are getting 4th Dimension production.* Production that is geared to the steady flow of Time.

Lipe AML Bar Feed Produces from 30% to 100% More Output by Eliminating Time Losses . . .

Time losses account for the enormous differences in output among workmen. By eliminating these losses automatically, the Lipe AML Bar Feed boosts overall production from 30% to 100%. That's because stock is fed to the machine independent of the operator. Constant pressure behind the stock assures uniform speed of feed. No feed fingers to fail or mar stock. No multiple feed-outs, even on the longest pieces.



Mail the coupon now for free literature giving full details on the Lipe AML Bar Feed.

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the simple flick that is required for the "flop-over" action provides ease and convenience of work insertion and removal.

The complete clearance feature makes the clamp particularly suitable wherever sheets of metal or plastic are positioned for light-duty processing.

It is available in two models—507-U and 507-S. The 507-U's feature the U-bar, recommended for adapting various spindles for proper work contact, especially where welding facilities are not available.

The 507-S's have a solid carbon-steel holding bar instead of the U-bar. They have a positionable bolt retainer which may be welded to the bar at any desired angle. This model is useful for holding sheets or strips of metal during processing or assembly operations, or for holding sheets of plastic during manufacturing operations.

The two-position mounting base, one on the bottom and one on the front of each clamp, give broad adaptability; a safety-ease grip makes manipulation safer and easier. Although the clamp weighs only 12 ounces it provides instant positive holding pressure of 600 lb. **T-11-1641**

Swing Lathe

A 13-in. swing UM56P lathe with 34 in. between centers has been introduced by Sheldon Machine Co., Inc., 4258 N. Knox Ave., Chicago 41, Ill. The machine, which incorporates a new pedestal design, offers several advantageous features. A double-walled apron has a friction disc-type clutch for engaging with power longitudinal and power cross feeds. Fifty-four different threads and pitches with numerous difficult threads are available through the quick-change gear box. Rapid selection of pitches and feeds can be made while the lathe is running. **T-11-1642**

Low-Cost Whiteprinter

A low-cost, fully automatic, high production whiteprinting machine, the Pease Challenger, is announced by the C. F. Pease Co., 3809 Rockwell St., Chicago 18, Ill.

This one-step feed machine includes an automatic tracing separation feature, is very fast in production, with printer and developer synchronized to a maximum of 40 fpm.

Light source for the Challenger is 4000 watt (82 watts per inch) high pressure mercury vapor lamp, controlled by constant wattage transformer. Other important features include a large feed table, simplified print feeding, front and rear print delivery, efficient print stacking front and rear, electronic speed control, interlocking multiple roller developer, metered ammonia control and good cooling and ventilating.

A front or rear automatic windup device is available as an accessory.

Paper travel through printer and developer is very short. At 40 fpm, an 8½ x 11-inch tracing is returned to the operator in 2½ seconds after feeding, and the finished whiteprint delivery in 6½ seconds. **T-11-1643**

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Handle small parts of nearly any shape or material in oriented position—single file—without damage. Instantly controllable feeding insures steady flow of parts at required production speeds. Electromagnetic—no mechanical wearing parts—ideal for use in automation set-ups.

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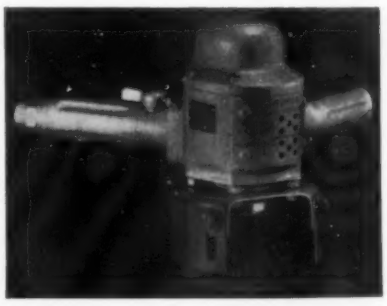
Vertical Grinder

A lightweight vertical grinder for cup wheels, cutoff wheels, sanding pads and wire brushes is announced by The Rotor Tool Co., 26300 Lakeland Blvd., Cleveland 23, O.

This 6¾-lb tool measures only 5½ inches to top of spindle washer or an over-all height (including spindle) of 7



inches, making it particularly useful for getting into close quarters.

It offers speeds of 8000, 6000 and 4500 rpm. Speed is controlled by a quick acting governor threaded into rotor shaft. This feature eliminates rocker arm from the design and simplifies maintenance.

The dead handle is removable for one-handed operation and live handle can be installed in any of four positions for operator's requirement. Automatic oiler and air strainer are built in. The safety handle is optional equipment. **T-11-1644**

Turning Tools

An improved line of Chip-Hog heavy-duty turning tools are now manufactured exclusively by The Gairing Tool Co.

Design of this tool incorporates carbide inserts clamped to durable high-alloy steel shanks, which are adjustable two ways, quickly replaced and gen-

erally available with preformed front and side clearance angles.

Rigidity of the Chip-Hog allows maximum feeds and speeds on lathes, shapers, planers and boring mills without danger of carbide cracks.

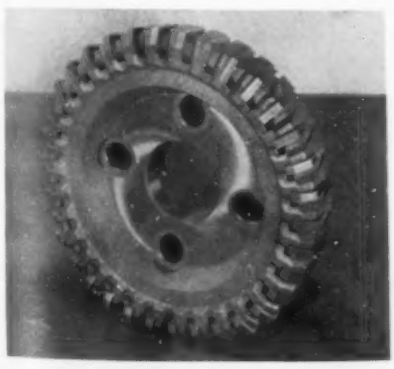
Primarily designed for heavy-duty work, these tools are equally efficient for semifinishing and finishing cuts.

A bulletin about the line is available from the company, P. O. Box 478, Detroit 32, Mich. **T-11-1651**

Roughing Cutter

A Shear Clear face mill developed by The Ingersoll Milling Machine Co., Rockford, Ill. is capable of an unusually high feed rate. In a specific application, it is feeding more than 100 inches per minute while rough milling main surfaces of automobile engine blocks and heads.

Prime reason for this achievement is the new blade angle, coupled with the Shear Clear free cutting shearing action. Cutting is done on the bevel portion of the blade, producing longer and thinner chips than normally expected. The face mill has tungsten carbide-tipped blades and can be used for a wide range of roughing work on many metals. Sizes are from 2½ in. diameter up. **T-11-1652**



Pneumatic-Hydraulic Power Unit

Faster action, damped terminal stopping, more powerful finish pressures and a full reversibility are combined advantages offered by the compact three-cylinder assembly of a pneumatic prime mover. This unit, available in two sizes, is made by Pantex Mfg. Corp., 521 Roosevelt Ave., Pawtucket, R.I., under the name of the Hydro-Air power unit.

The device achieves long stroke and fast operation through pneumatic-cylinder action, and a powerful closing force through differential hydraulic-piston action. Drive is by a very small quantity of compressed air at regular plant utility pressures. Stroke is 7 in., terminal force is either 2,100 or 5,600 lb weight is only 41 lb, space requirements are less than 1 cu ft. Air requirement per cycle is less than 0.11 cu ft.

The unit consists of three cylinders. One is for the fast, long pneumatic stroke (at right in the illustration). A second and largest cylinder (left in

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US HEADS
Most machine tool men have long relied upon the "US" Adjustable Multiple Spindle Drill Heads. But we are looking for those who still haven't tried them . . . and who are looking for the best.
With their quick-change universal joint assemblies, they are built for continuous use, with full anti-friction bearing construction for high capacity thrust loads. The universal joint adjustable multiple spindle type is suitable for any sensitive drilling machine. Joints are self-lubricating. All gears are hardened and shaved with spindles superfinished.
The single eccentric type is used for equally spaced holes on bolt circles.
The new double eccentric AdjUStafix, two to eight spindles, permits spindles to be located in non-symmetrical patterns. It eliminates expensive change in set-up.
Double eccentric type for irregular spacing
Universal joint with slip spindle fixed locating plate
Single eccentric type for equally spaced holes on bolt circles
Write for details on any type of universal joint adjustable head. Ask also about our totally enclosed gear-driven adjustable, fixed center, or individual lead screw tapping heads.
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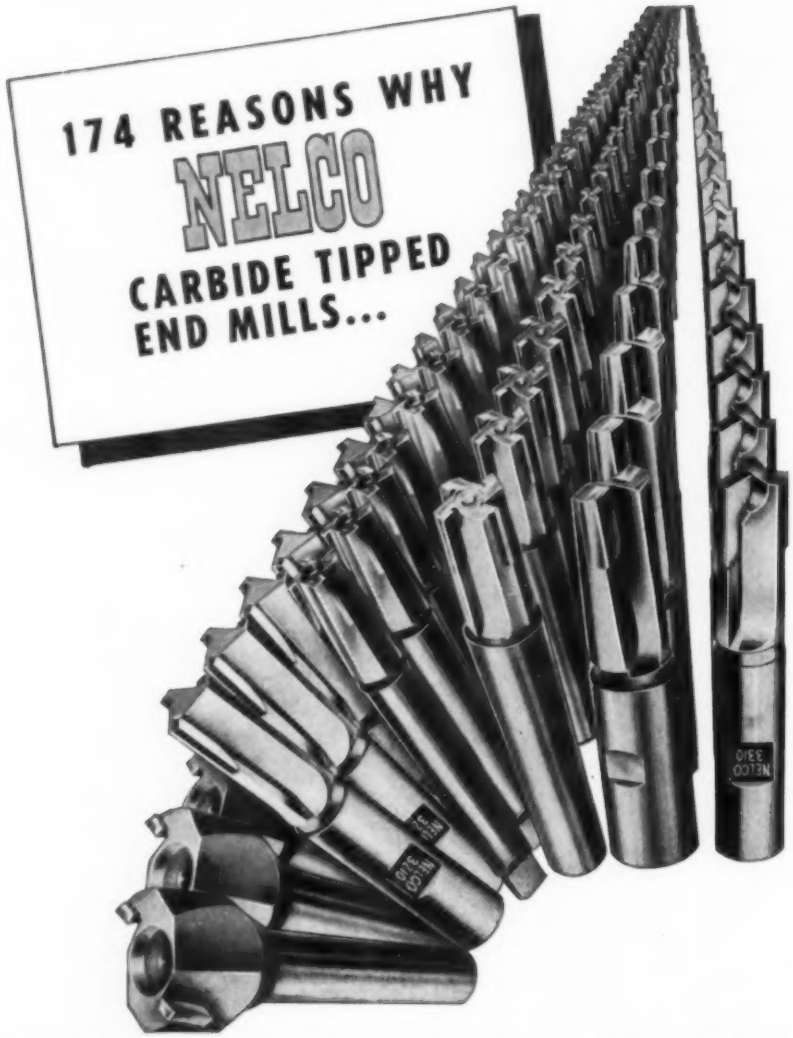

MAKE "JACK-OF-ALL-TRADE" TOOLS *Obsolete!*

174 different end mills — in diameters varying from ¼" to 5" — with 2, 3, 4 or 6 flutes — and straight or taper shank — make Nelco the line with the widest selection of standard sizes!

On every application, every material — there's a specific Nelco end mill in stock designed to do the job — and do it better, quicker and at less cost than it's ever been done before! Here are the facts to prove this astonishing statement:

Specific rake angles are engineered for each individual tool to guarantee maximum performance and life!

Selection of the hardest practical grade of carbide for each end mill makes available from stock the most efficient tool to do your specific job!

All Nelco End Mills are spiral fluted for easier chip clearance, finer finish and superior tool performance.

All taper shank end mills are available with detachable tang for interchangeable draw bar or tang drive use.

Eliminate "jack-of-all-trade" tools! Select a Nelco End Mill from stock, engineered to save hours and make dollars for you! Call the Nelco distributor in your vicinity and send today for your free copy of the new 48-page Nelco catalog.

NELCO TOOLS — *For that Extra Edge in Production*

NELCO TOOL COMPANY, INC., MANCHESTER, CONNECTICUT

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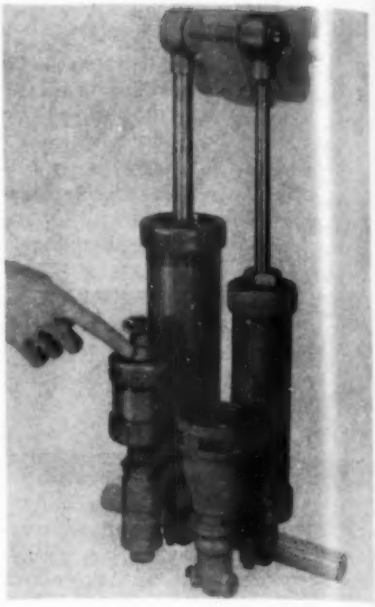

photo) provides the 12-to-1 hydraulic multiplication of trapped oil pressure for the finishing stroke—this incorporates constant-deceleration, terminal checking and temperature independence features. The third cylinder which is the booster (to which the finger points in photo) triggers the high-pressure finish stroke.

Main stroke speed is adjustable by air pressure regulation and has no influence on decelerating characteristics.

The standard one-ton model is 16½ in. overall closed length. **T-11-1661**

USE READER SERVICE CARD ON PAGE 167 TO REQUEST ADDITIONAL TOOLS OF TODAY INFORMATION

Go-Not Go Balancing Unit

Up to 240 or more parts per hour can be check balanced with a vertical static balancing machine recently developed by the Tinius Olsen Testing Machine Co. Since the machine operates on the go-not go principle, the human element is minimized. The operator merely puts a part on the balancing spindle and starts the machine. If the unbalance in the part falls within the preselected ounce-inch tolerance, a green light appears on the control panel. A red light shows if excessive unbalance is present. Signal lights are controlled by a separate unit which can be set for any desired tolerance of unbalance. The machine can also be operated as a standard static balancing machine.

Further information is available from the company's Balancing Department, 4106 Easton Rd., Willow Grove, Pa. **T-11-1662**

THE TOOL ENGINEER'S *Service Bureau*

TRADE LITERATURE CURRENTLY OFFERED BY THE TOOL ENGINEER ADVERTISERS

Literature Number	COMPANY	DESCRIPTION
A-11-268	American Broach & Machine Co.	**Rotary Broaching Machines**—American circular 300 gives data on standard American Vertical Hydraulic Surface Broaching Machines. (Page 268)
A-11-16	The American Tool Works Co.	**Duplicating Lathes**—Bulletin 35 describes the lathe and discusses economies available. (Page 16)
A-11-236-3	Ames Precision Machine Works	**Portable Hardness Testers**—Folder "Rockwell Hardness Testing Made Easy" describes the use and advantages of portable hardness testers. (Page 236)
A-11-259	Ampco Metal, Inc.	**Nonferrous Metals**—Literature describes general applications and descriptions of the various types of Ampco Metal. (Page 259)
A-11-192	Armstrong-Blum Mfg. Co.	**Metal-Cutting Saws**—Bulletin ST-650 shows shapes and sizes and describes applications of metal-cutting saws. (Page 192)
A-11-150	Armstrong Bros. Tool Co.	**Toolholders**—Catalog S-48 gives descriptions of Armstrong toolholders. (Page 150)
A-11-283	The Atrax Co.	**Carbide Reamers**—Carbide tools are described in 88-page manual and catalog. (Page 283)
A-11-263	The Bellows Co.	**Air-Powered Equipment**—Bellows "Controlled Air Power Devices" gives case histories for air-powered equipment. (Page 263)
A-11-266	Besly-Welles Corp.	**Taps**—"Handbook for Tap Users" contains information on tapping methods and tap selection. (Page 266)
A-11-177	Edward Blake Co.	**Sharpening Equipment**—Literature describes economies obtainable with tap resharpening equipment. (Page 177)
A-11-205	Boston Gear Works	**Gears**—Catalog lists 102 product groups and includes 30 pages of engineering data. (Page 205)
A-11-36	Brown & Sharpe Mfg. Co.	**Magnetic Chucks**—Catalog contains specifications on the complete line of Brown & Sharpe chucks. (Page 35-36)
A-11-156-1	Cardinal Machine Co.	**Machine Vises**—Bulletin 30-AM points out the various applications of "Speed Vises." (Page 156)
A-11-68	Clearing Machine Corp.	**Presses**—O.B.I. catalog explains why Clearing presses produce large quantities of parts and gives complete specifications of presses. (Page 68)
A-11-170	Cleveland Tapping Machine Co.	**Horizontal Tapping Machine**—Catalog TE-114 "Production Tapping Guide" gives machine tapping tips and describes the Three Way Horizontal Tapping Machine. (Page 170)
A-11-12	Cosa Corp.	**Profile Grinding Machines**—Catalog illustrates and describes the new Studer PSM-250 profile grinder. (Page 12)
A-11-274	Crane Packing Co.	**Lapping Machines**—Discussed in illustrated booklets are the possibilities of production lapping and of measuring surface flatness. (Page 274)
A-11-156-2	Detroit Stamping Co.	**Toggle Clamps**—Catalog describes the new De-Sta-Co Models 507 and 509. (Page 156)
A-11-154	H. E. Dickerman Mfg. Co.	**Die Feeds**—Information on Rol-Di-Feeds and the complete Dickerman line is contained in descriptive literature. (Page 154)
A-11-206	The DoAll Co.	**Band Saws**—New wall chart "How Basic Tools Created Civilization" is obtainable on company letterhead. (Page 206)
A-11-15	Federal Products Corp.	**Dial Indicator Gages**—Federal gages, Catalog 52 tells the complete story of Federal gages. Price lists are also available. (Page 14-15)
A-11-178	The Gaertner Scientific Corp.	**Toolmakers' Microscopes**—Bulletin 147-50 gives detailed descriptions of optical instrumentation. (Page 178)
A-11-19	Gisholt Machine Co.	**Superfinishers**—Textbook "Wear and Surface Finish" is a complete and authoritative reference on the subject of superfinishing. (Page 19)
A-11-176	Gorham Tool Co.	**End Mills and Milling Cutters**—120-page catalog shows entire line and contains valuable engineering data. (Page 176)
A-11-186	George Gorton Machine Co.	**Indexing Pantographs**—Forms 2595-DS2611 and 2604-DS2611 describe the Gorton multiple-spindle indexing pantographs. (Page 186)
A-11-225	Gulf Oil Corp.	**Quenching Oil**—"Gulf Super-Quench" discusses the advantages of dual-action quenching oil. (Page 225)
A-11-32	Hannifin Corp.	**Hydraulic Cylinders**—Full story of Hannifin products is described in Bulletin 150. (Page 32)

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A-11-63	Hydra-Feed Machine Tool Corp.	**Automatic Lathes**—Catalog discusses the features of a new line of lathes. (Page 62-63)
A-11-204	The Hydraulic Press Mfg. Co.	**Air and Hydraulic Cylinders**—Twenty-eight-page condensed catalog covers the complete H-P-M line of hydraulic components. (Page 204)
A-11-160	The Johnson Gage Co.	**Thread Gages**—Illustrated literature explains how to get maximum thread control at lowest cost. (Page 160)
A-11-284-1	Kaufman Mfg. Co.	**Tapping Machines**—A description of features and advantages of Kaufman tapping machines is given in Catalogs 754 and 1153. (Page 284)
A-11-151	Kling Bros. Engineering Works	**Double Angle Shears**—Bulletin tells in detail how double angle shears work and what they can do to save users time and money. (Page 151)
A-11-8	Landis Machine Co.	**Thread Chasers**—Bulletin F-90 describes the wide range and compactness of Landex heads. (Page 8)
A-11-280-2	Louis Levin & Son, Inc.	**Micro-Drills**—Bulletin N lists sizes and prices of stock drills and micro-drilling equipment. (Page 280)
A-11-155	The Lincoln Electric Co.	**Automatic Welding Equipment**—Complete facts on Lincoln's automatic welding equipment is available on company letterhead. (Page 155)
A-11-220	M.B.I. Export & Import Ltd.	**Heavy-Duty Lathes**—Illustrated brochure 100 gives answers to prospective users' requirements. (Page 220)
A-11-234	Metal Carbides Corp.	**Tungsten Carbide Stock**—Eighty-four-page catalog 54-G shows the various shapes, sizes and lengths of Talide tungsten carbides. (Page 234)
A-11-227	Miller Fluid Power Co.	**Air and Hydraulic Cylinders**—Full details are contained in Miller Bulletin B-200. (Page 227)
A-11-54	The Monarch Machine Tool Co.	**Turning Data**—"Speeds and Feeds for Better Turning Results" gives steady results from studies concerning basic facts of turning. Also included are tool angles, machinability ratings, pertinent to plain and carbon alloy steels, tool steels, stainless steels, etc. (Page 53-54)
A-11-183-1	Morton Machine Works	**Fixture Plants and Components**—Seventy-two-page catalog includes illustrations and full-size tracing templates of each product. (Page 183)
A-11-211	The New Britain Machine Co.	**Boring Machines**—Catalog includes details of a variety of specific parts turned out on New Britain machines. (Page 210-211)
A-11-215	Ortman-Miller Machine Co.	**Air and Hydraulic Cylinders**—Catalog and complete set of ½ and ¼-scale templates showing all cylinders and mounting brackets are available on request. (Page 215)
A-11-173	Reliant Gage & Supply Co.	**Gages**—Catalog shows the range of applications and the variety of gages obtainable. (Page 173)
A-11-200	Ring Punch and Die Co.	**Punches and Dies**—Twenty-page illustrated catalog gives complete line of perforating products. Detailed dimensions and prices for each size are given. (Page 200)
A-11-181	The Rotor Tool Co.	**Air Tools**—Catalog 47 gives specifications and describes the models manufactured by Rotor. (Page 181)
A-11-262-1	Royal Press Co., Inc.	**Press Brakes**—Catalog 54B lists special features of Royal press brakes. (Page 262)
A-11-212-3	George Scherr Optical Tools, Inc.	**Parts Comparators**—Illustrated folder coded GINZE describes a new model Optical Comparator. (Page 212)
A-11-201	The S-P Mfg. Corp.	**Heavy-Duty Air Cylinders**—Catalog 109 contains information on heavy-duty air cylinders. (Page 201)
A-11-169-1	Standard Parts Co.	**Fixture Keys**—Sixty-six-page catalog gives complete description of fixture keys. (Page 169)
A-11-179	Vlier Engineering, Inc.	**Torque Thumb Screws**—Catalog 50 describes the various types of torque screws and discusses economies available. (Page 179)
A-11-255	Waldes Kohinoor, Inc.	**Grooving Tools**—Twenty-page technical manual contains full engineering data and cost reduction features of recessing tools. (Page 255)
A-11-190	S. B. Whistler & Sons, Inc.	**Die Units**—Catalog illustrates and describes quick setups available with Whistler magnetic perforating dies. (Page 190)
A-11-254	Wiedemann Machine Co.	**Turret Punch Presses**—Bulletin 241 points out time saved in piercing and in template making and describes the features of Wiedemann presses. (Page 254)

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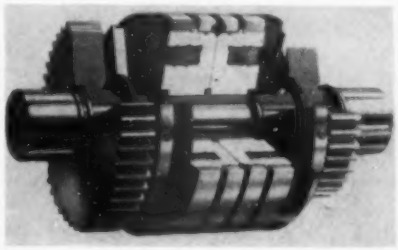
INDICATE A-11-169-1

Electromagnetic Clutch

I-T-E Circuit Breaker Co., Rectifier Div., Philadelphia, Pa., announces availability of its recently designed electromagnetic clutches. This electro clutch meets requirements of transmissions employing constant mesh gearing. Design provides constant hp output,



quiet operation and rapid speed change. Safe positive operation is assured because control is through a 24-volt d-c circuit which permits no field adjustment of the torque value of the clutch. Maintenance is minimized since the unit is self compensating and no adjustment for wear of the clutch plates is required. **T-11-1691**

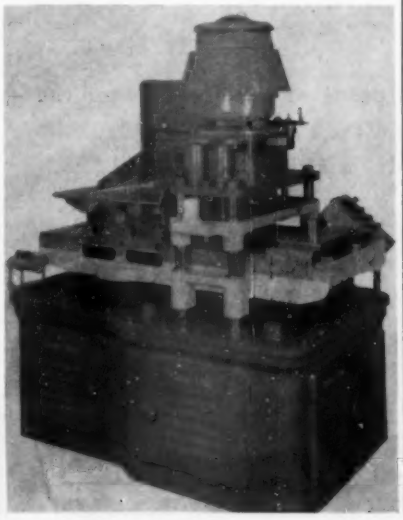
529-Spindle Drilling Unit

Zagar Tool, Inc., has designed a high-speed drilling machine in which all movements are mechanical, in contrast to the conventional hydraulic system used on its other drilling units.

The 529-spindle drill head is directly driven with a 30-hp motor. The ram is actuated by a mechanical motion similar to that of a shaper and is located in the base of the machine.

Diameter of holes drilled by this machine is 3/16 inch. The drill head is of the gearless design, thus permitting centers as close as 1/4 inch.

Length of stroke, depth of drill and



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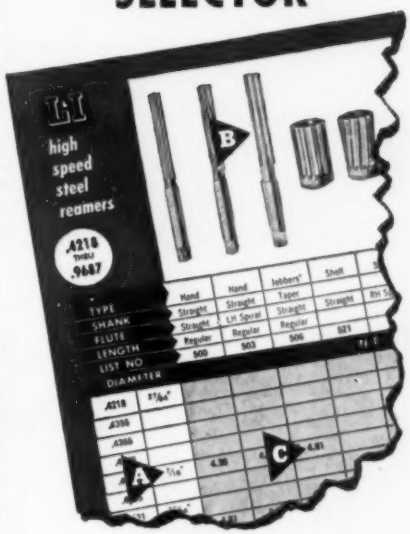

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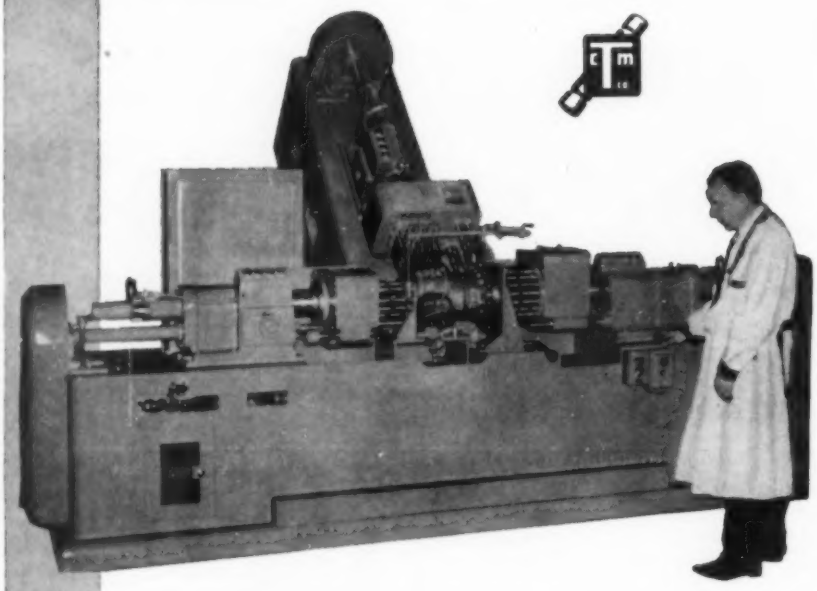
INDICATE A-11-169-2

Another Cleveland Design to Speed Production!



3-WAY HORIZONTAL TAPPING MACHINE

OPERATION: Tapping 48 holes in crankcase. Tapping time (48 holes) 7.9 seconds.

DESCRIPTION: A Cleveland Three Way Horizontal Tapping Machine with two F-2 Cleveland Tapping Heads opposed at each side and one F-2 head at 45° up at the rear with multiple heads on each head to suit the part. The right hand tapping head has a multiple head with 18 spindles; the left hand tapping head has a multiple head with 12 spindles; the rear vertical unit has a multiple head with 20 spindles.

The operator loads part into position between the tap guard plates and then moves the lever to the closed position and starts the machine. All heads tap simultaneously.

Send for your copy of this Guide

Write today for Catalog No. TE-114

CLEVELAND
tapping machine co.
A Subsidiary of AUTOMATIC STEEL PRODUCTS, INC. • CANTON 6, OHIO

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rate of speed can be adjusted to hole finish requirements.

Material to be drilled is loaded manually into a hopper and mechanically positioned under the drill head for the drilling cycle. Removal of the drilled part can be done by the next piece as it is fed mechanically to drilling position.

More details are available from the company, 24000 Lakeland Blvd., Cleveland 23, Ohio **T-11-1701**

Semiautomatic Hardness Tester

Wilson Mechanical Instrument Div., American Chain & Cable Co., Inc., has perfected a Rockwell motorized hardness tester, the Model Y, which is semiautomatic in operation. Its short test cycle permits an increased number of Rockwell readings to be taken and recorded within a definite time period.

The motor's function in the test cycle is to remove the major load. The cycle of major load operation is less than 2 seconds. Application is controlled through a dash pot, allowing infinitely variable speed.

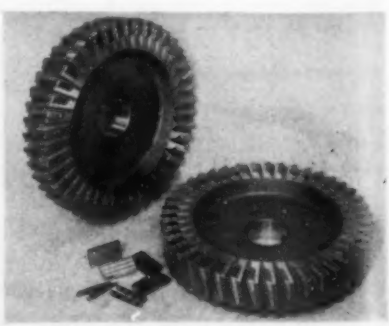
The unit is furnished with a 1/16-inch steel ball penetrator chuck, complete set of anvil, dead weights for applying 60, 110 and 150 kg major loads. Bench space needed is 12 by 20 in. **T-11-1702**

Milling Cutter

An inserted blade milling cutter series, capable of feeds in excess of 100 ipm and employing four or more blades per inch of diameter, is announced by the Wesson Co., 1220 Woodward Hghts. Blvd., Detroit, Mich.

Designed for high feed, cast iron finishing, this 7200 series cutter consists of a hardened steel body with broached blade slots, Wessonmetal carbide tipped blades and hardened steel wedges. The specially designed blades are over 1 inch high with large steps or grooves.

The cutter is available in diameters from 6 to 20 inches. **T-11-1703**



Precision Spindles

A variety of designs of precision spindles made by Standard Electrical Tool Co., 2488-96 River Rd., Cincinnati, Ohio are being displayed at the Metal Show in Chicago. Among them (illustrated at bottom of photo) is a precision spindle with wheel flanges to accommodate large bore grinding wheels. It offers traverse up to 4½ in. either through lead-screw or push-rod actuated by cylinder control. Neoprene bellows protect the reciprocating spindle housing. **T-11-1711**

USE READER SERVICE CARD ON PAGE 167 TO REQUEST ADDITIONAL TOOLS OF TODAY INFORMATION

Cylinders for Small Space

A line of hydraulic cylinders that require minimum installation space is available for machine tool, metalworking and general purpose industrial applications from Vickers Inc., 1400 Oakman Blvd., Detroit 32, Mich.

These "Compact" cylinders, manufactured by the company's Waterbury Tool Div. are designed to comply with JIC standards. They occupy minimum space due to use of square rod end and head ends that house the pipe connections. The cylinders are rated for a maximum working pressure of 2000 psi.

They can be furnished with adjustable hydraulic cushions on either or both ends to decelerate piston rod movement. Mounting flexibility is achieved through provision for multiple positioning of ports and air vents. Each port can be independently rotated to any 90-degree position in relation to the mounting. The honed cylinder can be rotated so that the ball-and-set-screw air vents (provided when specified) are at the top regardless of mounting position. Five different mountings are available: foot or bracket, flange at either head or rod end, extended tie rod, and clevis.

The series comes in standard sizes from 1½ to 6-in. bore. **T-11-1712**

HOW IMPORTANT IS
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The Severance Chatterless Countersink is Engineered for today's fast production schedules. It will give you what you've always wanted in a countersink—
CHATTERLESS ACTION
SMOOTH SEATS
FAST CUTTING
LONG SERVICE
Take advantage of last minute developments in countersink design—
Save Time and Money!
Order Directly From This Ad.
Severance CHATTERLESS
COUNTERSINK SET No. 27
Set No. 27 contains a 1/4", 3/8", 1/2", and 3/4" countersink. These sizes will cover a big majority of your countersinking operations. They'll come to you in a specially designed case which closes flat so as to fit in standard tool-box drawers.
Order by Set No. with centerline angle desired, thus: 1 only Set No. 27-41°, 10 only Set No. 27-45°, etc.
SEVERANCE CHATTERLESS COUNTERSINK SET No. 27 including Flat Wooden Case *$9.50
*Plus 10% in less than 10 Sets.
TOOL NO | BODY DIA. | SHANK DIA. | *LIST PRICE
BA | 3/16 | 3/16 | 1.30
CB | 1/4 | 3/16 | 1.30
DC | 5/16 | 1/4 | 1.60
EC | 3/8 | 1/4 | 1.85
GD | 1/2 | 3/8 | 2.40
IE | 5/8 | 3/8 | 3.50
JF | 3/4 | 1/2 | 4.60
KG | 7/8 | 1/2 | 5.75
LI | 1 | 1/2 | 7.00
NJ | 1 1/4 | 3/4 | 10.25
PK | 1 1/2 | 3/4 | 13.65
RL | 1 3/4 | 1 | 17.10
SM | 2 | 1 | 20.50
WHEN ORDERING GIVE: TOOL NO. AND CENTER-LINE ANGLE DESIRED.
THUS: 12 ONLY CB-30°; 24 ONLY GD-41°; ETC.
* PLUS 10% IN LESS THAN 10 OF ANY ITEM
Save Time! Save Money
ORDER DIRECTLY FROM THIS AD
THE Severance LINE ALSO INCLUDES
1/4" SHANK MIDGET MILLS HIGH SPEED AND CARBIDE
TUBE DEBURRING CUTTERS
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ASK FOR A SEVERANCE CATALOG TODAY!
Severance TOOL INDUSTRIES INC.
728 Iowa Avenue, Saginaw, Michigan
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Technical Shorts...

Protection for Moving Metals

LONGER WEAR for moving metal surfaces is promised through the armoring process recently introduced to industry through the newly formed Armoloy Co. The process was developed to provide means of reducing friction on bearing and cutting surfaces. However, it also is said to provide a harder lubricated surface, finished within specified dimensions that will not crack, chip, flake or peel when the treated surface is subjected to standard bend tests over a radius equal to one-half the thickness of the material to which it is applied.

Succesful application on bearings, ball races, saws, machine tools, dies and many perishable small cutting tools, indicate that Armoloy may be applied to practically any point where friction occurs between metals. In addition to this universal usefulness, single application is supposed to be sufficient for the product's life.

The process, which is a rigidly controlled multi-stage operation involving electrodeposition, provides a surface which meets hardness tests from 1,000 to 1,240 on the Vickers scale or the equivalent of 66 to 70 Rockwell C.

* * *

Soluble Chemical for Bushings

SOLUTION TO the problem of maintaining alignment of waveguide hardware and other equipment is reported in a recent issue of Navy Technical News. With the technique developed by the Naval Research Laboratory, sodium chloride is used for bushings and spacers during soldering. Main advantage gained from these chemical pieces is that chemically pure sodium chloride is easily removed simply from a completed assembly. Still other advantages are gained through utilizing sodium chloride for this work. It is easily compressed into desired shapes; it has a melting point of 804 C; and is readily dissolved in water.

In the past, precision assembly and alignment either were impossible or were done with the use of undissolvable materials which were difficult to remove.

* * *

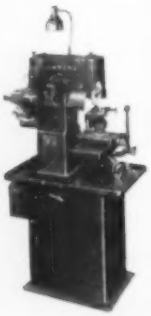
Economical Plastic Making

PRODUCTION OF plastic pipe and other forms has been made easier and cheaper through a method for manufacturing furfuryl alcohol resin developed at Armour Research Foundation Institute. This simple method was invented by Erik R. Nielsen, senior chemist at the Foundation. It involves forming a resin intermediate quickly and smoothly by heating furfuryl alcohol in the presence of an activated alumina. Contrary to former requirements, there is no need for a strong acid catalyst. An intermediate is a liquid or semiliquid, which can be blended and then cured to produce the final stage resin.

In the past, a solvent, generally water, was added to moderate the reaction. Neutralization and washing was necesary to inactivate the acid catalyst, after which the intermediate had to be dried, usually in a vacuum. By deleting the need of a catalyst, the new process avoids these steps.

A SHARP POINT EVERYTIME!

Hammond of KALAMAZOO
CARBIDE TOOL GRINDERS

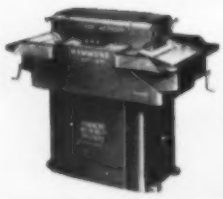


Ask any user of the MORE THAN 6,000 HAMMOND CARBIDE TOOL GRINDERS now in service — "point by point" all the way through — these machines are precision built for efficient trouble-free grinding of CARBIDE AND HIGH SPEED STEEL TOOLS.
There's no substitute for experience, and Hammond has been building dependable machinery for more than 70 years!

Write for Catalog

Model CB-77 Chip Breaker and Diamond Finishing Grinder for handling box and single point tools. (Model CB-77W for wet grinding also available).

Model WD-10 Wet or Dri 10" Carbide Tool Grinder with double cup wheel construction. (Available with straight and cup wheel also).



Model 14-WD Wet or Dri 14" Carbide Tool Grinder. Designed for production grinding of medium and large size tools. Will quickly pay for itself in longer tool life, wheel economy, and faster grinding.

"Good Machinery Since '82"

Hammond Machinery Builders INC.
1661 DOUGLAS AVENUE • KALAMAZOO, MICHIGAN
FOR FURTHER INFORMATION, USE READER SERVICE CARD, INDICATE A-11-172

only does this process make production cheaper, but it is superior for various other reasons. Resin intermediate may be produced in a wide range of viscosities with good storage stability. At the same time, it may be produced with little or no monomeric furfuryl alcohol.—When this residue is present in substantial amounts it causes undesirable shrinkage in a final product.—Reactive resins varying in consistence from semi-solids to grindable solids may be produced from the intermediate produced by the new process.

Currently, work sponsored by the T. F. Washburn Co., is under way to find how the substance can be used to make a low cost plastic pipe extrusion.

* * *

Testing by Ultrasonics

Among exhibits at the recent Research in Industry Exhibition in Glasgow, Scotland, was a portable ultrasonic flaw detector. The instrument, made by Kelvin and Hughes, Ltd., is used to find through nondestructive means metal flaws such as hair-line cracks, porosity, an nonmetallic segregation, thermal cracks or blow-holes. The detector, which can pick out flaws down to 12 feet below the surface, works with excellent accuracy.

* * *

Films Explain Hydraulics

Operation of hydraulic components is explained in a four-color slide-lecture program recently completed by The Denison Engineering Co. With the present emphasis on greater production at lower cost, and the interest in hydraulic units of all types, these lectures have been created with an aim toward keeping the engineer and designer up to date on the latest developments in the field of fluid power. These components are covered in the program: axial piston pumps and motors, vane pump motors, directional valves, surge damping valves, flow controls, and hydrostatic valves. Each unit is described with the aid of from six to 15 slides, depending on the complexities of the unit.

This slide-lecture program, the first of its kind in this field, is available for use in schools, engineering societies, company training programs, etc. Details are available from Mr. Marion Burton, advertising manager of the company, 1236 Dublin Rd., Columbus, Ohio.

. . . applications unlimited!

New multi-purpose GAGES

. . . . . built with adjustable, interchangeable units used in combination, for gaging:

OUTSIDE DIAMETERS
0" to 6"

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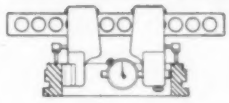
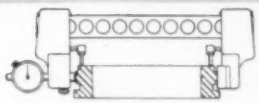


Gaging inside diameter

LENGTHS



Length gage

GROOVES, SLOTS, SHOULDERS
with quick-change, blade type contacts

AS BENCH COMPARATOR

Bench Stand

Bench Comparator

WITH BENCH STAND

0" to 3"
BASIC GAGE
with .0005 indicator as shown
$57.50

Only two gages NEEDED TO COVER 0" to 6" dia. range!

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Men at Work . . .

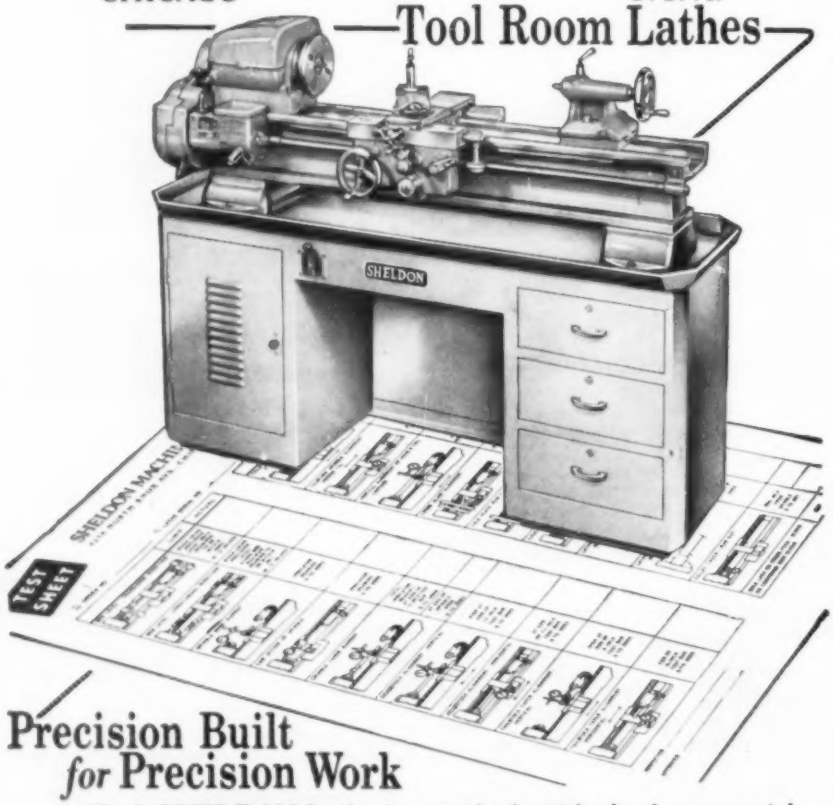
Heppenstall Co. has revealed the appointment of **Robert B. Heppenstall, Jr.** to the post of general manager of the Bridgeport, Conn., plant to succeed the late Alfred J. Porter. Mr. Heppenstall who formerly was manager of market research, represents the fourth generation of Heppenstalls associated with the firm.

Appointment of **Harold Wrigley** as works manager and of **Charles S. Basney** as new products manager has been made public by the Barry Corp. Since joining Barry in 1951. Mr. Wrigley has been the company's plant superintendent, while Mr. Basney has been serving as production control manager for the past two years.

SHELDON

CHICAGO U. S. A.

Tool Room Lathes



Precision Built *for* Precision Work

Each SHELDON Lathe is a precision machine tool that in final inspection has passed the 19 accuracy checks on the SHELDON "Inspection Test Sheet."

Produced by modern methods with the finest special machines, these 10″, 11″ and 12″ (swings 13″) lathes are quality built on a quantity production basis. Selling at quantity production prices they are today's best lathe values.

Write for Catalog with Check Chart

SHELDON MACHINE CO., INC. 4229 North Knox Ave., Chicago 41, Illinois

FOR FURTHER INFORMATION, USE READER SERVICE CARD; INDICATE A-11-174

At the recent annual meeting of Pressed Metal Institute, **Samuel Morrison,** president of Morrison Steel Products, Inc., was elected Institute president. Vice-presidents elected were **J. H. Boehm,** president of The Boehm Pressed Steel Co., and **C. Glenwood Rose,** president of Judson and Rose, Inc., **W. B. Gemmill,** treasurer of The American Stamping Co., was made PMI's secretary-treasurer.

John M. Kelley has been made vice-president in charge of engineering for the Adel Precision Products Div. of General Metals Corp. He has been in administrative charge of engineering at Adel for the past 14 years.

Harold F. Marsh has been elected president of the General Manufacturing Co. At the same time, **F. C. Hossie,** founder and designer of flexible power presses, was elected to the office of secretary.

The created post of director of purchases and production planning for the Louis Allis Co. has been filled by **Hans M. Larsen.** Associated with the firm for 35 years, Mr. Larsen will now be responsible for all purchases made by the company as well as motor production scheduling.

Edwin L. Wiegand Co. has announced the appointment of **Joseph L. Nelson** as design manager of its Specialty Products Div. Previously Mr. Nelson was product styling manager at Magic Chef, Inc.

Herman J. Schorle, who formerly was works manager of Bendix Aviation Corp., at Teterboro, N. J., now fills a like post with the Tobe Deutschmann Corp., Norwood, Mass.

Three appointments have been made by Carboloy Dept. of General Electric Co. **Robert A. Canning,** former manager of product engineering, is now manager of quality control. **Robert L. Bell,** who has been superintendent of metals has been named manager of manufacturing engineering. **E. C. Graves,** previously superintendent of fabricating, was made superintendent of product manufacturing.

Arthur J. Miller, Jr. is new president and general manager of Chicago Wheel & Mfg. Co. succeeding A. J. Miller, Sr. who was named chairman of the board.

A. B. Drastrup, formerly executive vice-president of A. M. Byers Co., has now been elected to the office of president of the company succeeding L. F. Rains.

Joseph D. Loveley now is vice-president in charge of engineering of Airtemp Div. of Chrysler Corp. He formerly was the company's chief engineer.

Marc Bendick, former head of Bridgeport Industries, was elected president of Barnaby Mfg. Co., Inc., to fill the vacancy made by the retirement of Barnabus Toth.

American Die Casting Institute elected **William J. During,** head of Precision Castings Co., Inc., as its president for the coming year. **George Ralls,** of Pressure Castings, Inc. was elected vice-president of the Institute, and **David Laine** of New York was re-elected secretary.

Appointment of **James C. Kelley** to the post of general manager has been announced by the American Machine Tool Distributors' Assn. Mr. Kelley previously was connected with the Department of Commerce's metalworking equipment division as deputy director.

Edward C. Hamm has been named vice-president and director of sales of The Colson Corp. Since 1946 he has been president and geenral manager of the Service Caster & Truck Corp.

Edward R. Maddock has been named works manager of Worthington Corp.'s Decatur, Ala., Works. He has been product manager of condensers, heaters and ejectors.

According to recent announcement. **Charles E. Peterson** has been made chief metallurgist of Mackintosh-Hemphill Co. He has been associated with the company since 1949.

During the recent election that made Arthur J. Miller Jr. president and general manager of Chicago Wheel & Mfg. Co. these officers also were elected: **Henry E. Miller** was made vice-president and general production manager; **Henry M. Mann** became treasurer and chief of sales engineering; and **Arthur T. Dalton** was elected secretary and general sales manager. Mr. Dalton is a member of ASTE's Chicago chapter.

I. Danielson was elected vice-president emeritus of the firm, and will continue in his present capacity of advisor on financial matters.

BIG SAVINGS *in* PRODUCTION TIME ...*and* INCREASED ACCURACY!

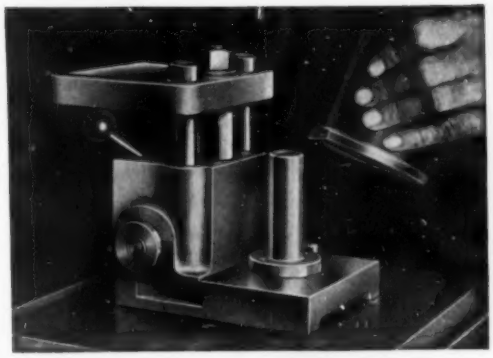
...yours with the

New A·B·C

LIFT SWING

Drill Jig

VISE



The PATENTED "Swing Away" Top Plate can be moved completely out of the way, permitting faster loading, easier nesting, ready inspection of the part, simplified and easier unloading.

Placed over the work in locking position, the Top Plate is aligned in the same way as a precision Die Set, by means of two hardened and ground bushings which glide over immovable, precision ground guide pins. There is no play to permit inaccurate registry.

A positive and simple locking mechanism locks the fixture securely, with a slight pressure on the handle. The same slight pressure releases the top plate and raises it to swing position. *Drill in TWO places* — The Lift Swing feature can be laid on its back to perform drilling operations in *second* plane, 90° from that of the original drilling.

"Impossible holes" become possible — Using a *double* top plate which can be swung a full 180°, you can drill two holes side by side with a minimum wall thickness between and without regard to the wall thickness of the drill jig bushings themselves. Also, you can drill a smaller or larger hole without removing the piece from the fixture. You simply drill, lift, swing plate — then lock and drill again.

Write for Color Circular L. S., which gives detailed engineering information, diagrams, range of plate and fixture sizes, etc. Demonstration in your own plant may be arranged. No obligation.

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GORHAM

END MILLS AND MILLING CUTTERS

For profitable solutions to production milling problems, call on Gorham! Over thirty years' experience in creating fine cutting tools is your assurance of satisfaction.

An extensive line of *standard* end mills and milling cutters is stocked by Gorham distributors. When you need *special* tooling, a Gorham Field Engineer surveys your problem and makes design recommendations for a tool to be "tailor-made" for your application by skilled Gorham craftsmen.

Ask your distributor for Gorham "standards." For "specials," call in your nearby Gorham Field Engineer. They're both well qualified to help you . . . and backed by unmatched experience and facilities. For profitable solutions to milling problems, call on Gorham! There's no obligation.

Write for free 120 page catalog. Shows entire line, contains valuable engineering information.

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WEST COAST WAREHOUSE: 576 North Prairie Ave., Hawthorne, Calif.

FOR FURTHER INFORMATION, USE READER SERVICE CARD:. INDICATE A-11-176

The Gear Grinding Machine Co. has announced appointment of **William F. Wilson** to the position of vice-president in charge of engineering and manufacturing. Prior to this promotion, Mr. Wilson was the company's work manager.

The board of directors of The Taft-Peirce Mfg. Co. recently elected **F. Steele Blackall, III** a vice-president of the company. He also is assistant treasurer and a director.

Hugh Gibbons has been appointed supervisor of the Rx-Met Div. of Michigan Steel Casting Co. He formerly was with the Cannon Muskegon Corp where he was plant superintendent.

Atkins Saw Div. of Borg-Warner Corp. has made public the appointment of **Carl J. Meister** as vice-president-sales. Prior to this, Mr. Meister was vice-president and director of sales for the Atlas Chain and Mfg. Co.

J. P. Coughlin, formerly manager of the Arc Welding Div. of Westinghouse Electric Co. has been made assistant to the president of Eutectic Welding Alloys Corp.

Several new appointments have been made public by Jones & Laughlin Steel Corp. **Howard S. Turner** has been named vice-president of research and development succeeding **H. W. Graham**, also a vice-president, who became consultant on technology. Dr. Turner was previously director of research and development division of Pittsburgh-Consolidated Coal Co. **Harold T. Clark**, now becomes director of research. Dr. Clark had been the assistant director. **Robert E. Minto** now is chief metallurgist of the company's Cleveland Works Div. after having served as assistant chief metallurgist since 1950. He is succeeded by **Jack W. Culver** who has been plant metallurgist and chief inspector of the Electricweld Tube Div.

Robert H. Davies has been named vice-president in charge of engineering for The Parker Appliance Co. and its subsidiaries. He has been engineering manager of the firm since 1946.

Former operations manager of Alloy Rods Co., **Joseph P. Costigan** has been made works manager of American Machine & Foundry Co.'s Buffalo plant.

At a meeting of the board of directors of Crucible Steel Co. of America, **William A. Coolidge** was elected a director of the company. Mr. Coolidge is chairman of the board of National Research Corp., a partner of Crucible in the ownership of Vacuum Metals Corp.

Trade Literature

For Free Booklets and Catalogs—Convenient Request Card on Page 167

Metal Cutting Tools

Expanded 44-page catalog describes and illustrates complete line of modern metal cutting tools, including various type milling cutters, and single point tools; covers dimension and price lists. The Viking Tool Co., Shelton, Conn. **L-11-1**

Thread Gages

Illustrated folder describes reversible plug thread gages; offers clear view of construction, outlines advantages of line, and gives complete information for ordering. John Bath & Co., Inc., 23 Grafton St., Worcester 8, Mass. **L-11-2**

Roll Forming Equipment

Thirty-two page catalog No. 54 covers Ardcor roll forming equipment; contains basic engineering data illustrated by specification drawings and photos. American Roller Die Corp., 29401 Clayton Ave., Wickliffe, Ohio. **L-11-3**

Exhaust Fans

Catalog 500-B discusses line of industrial exhaust fans, describes various applications, types and construction; includes dimensional data and capacity tables. Principles of application and pertinent engineering data on Cyclone separators also described and illustrated. Fort Worth Steel and Machinery Co., P.O. Box 1038, Fort Worth 1, Texas. **L-11-4**

Brazing

Pocket-size how-to-do-it book entitled "Brazing Manual" covers pertinent data for brazing various forms of copper, brass, steel, aluminum and cast iron. Discusses practical aspects of brazing such as found in various fields. Presented in simple terms with diagrams for clarification. All-State Welding Alloys Co., Inc., 249-55 Ferris Ave., White Plains, N. Y. **L-11-5**

Lubricants

Literature presents service recommendations for industrial lubricants describing various grades of Gredag products and outlining appropriate applications. Gredag, Inc., Niagara Falls, N. Y. **L-11-6**

Investment Castings

Informative pocket-size booklet, "How To Design Precision Investment Castings" covers details of casting by lost wax process, outlining both benefits and limitations of method; also discusses basic design principles as they apply to investment casting processes; includes case histories. Write directly to Midwest Precision Castings Co., Dept. TE, 2790 Grand Ave., Cleveland 4, Ohio.

Knife Grinders

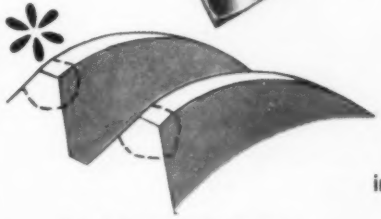
Complete catalog on knife, shear blade and circular slitter-type knife grinders available to executives, engineers, plant superintendents and master mechanics concerned with these tools; includes data on construction, design, capacity and types of drives. Illustrated. Hanchett Manufacturing Co., 906 N. State St., Big Rapids, Mich. **L-11-7**

stop wear before it starts!

You can obtain almost unbelievable savings in taps simply by keeping them sharp. For once the face of a single tooth begins to wear, the accuracy and life of the tap begins to go down hill very rapidly.

With the Blake Precision Sharpening System, you can: (1) sharpen taps at regular, planned intervals, and (2) sharpen flutes and chamfers of taps to an exceptionally high degree of accuracy.

Far longer tap life, precisely tapped holes are possible with the Blake Chamfer Grinder and the Blake Flute Grinder.



Here is the most delicate part of the tap. If the face of the teeth are reground before wear begins, tap life can be increased several hundred percent.

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EDWARD BLAKE COMPANY

450 CHERRY STREET • WEST NEWTON 65, MASS.

Black Diamond Precision Drill Grinders • Surface Finish Standards

BLAKE PRECISION SHARPENING SYSTEM

FOR FURTHER INFORMATION, USE READER SERVICE CARD; INDICATE A-11-177

Plating

Bulletin B 50-54 presents complete details of automatic plating machine including comprehensive explanation of transfer and conveying principle involved with drawings and illustrations showing basic movements; describes all components in detail; outlines information on maintenance, installation, lubrication, construction, special adaptations. Automatic Plating Equipment Div., Wagner Brothers, Inc., 400 Midland Ave., Detroit 3, Mich. **L-11-8**

Turning Data

Technical information gained from its own research program offered in 36-page brochure to engineers and lathe operators as guide to establishing proper cutting speeds and feeds; includes data on machinability ratings, tool angles, suggestions regarding coolants for various metals as well as other information relevant to metal turning. Request only on company letterhead directly to advertising department of The Monarch Machine Tool Co., Sidney, Ohio.

Gaertner OPTICAL INSTRUMENTATION

TO INSURE UNIFORM, ACCURATE PRODUCTION PARTS USE THE GAERTNER TOOLMAKERS' MICROSCOPE TO CHECK TOOLS, DIES AND GAGES

THE
GAERTNER TOOLMAKERS' MICROSCOPE
M2001ARS
2x4 inch Coordinate Measurement
Direct Reading to .0001 inches
Bulletin 147-50 tells the story in detail

THE GAERTNER SCIENTIFIC CORPORATION
1241 Wrightwood Avenue • Chicago 14, Illinois

FOR FURTHER INFORMATION, USE READER SERVICE CARD; INDICATE A-11-178

Universal Joints

Brochure C3 10M-7-54 presents details on company's line of universal joints, outlining 14 sizes maintained in stock, describes its manufacturing facilities, production features, testing methods for quality control. Discusses how to select proper joint for specific case, lists purchasing and engineering data. Illustrated. Curtis Universal Joint Co., 20 Birnie Ave., Springfield 7, Mass. **L-11-9**

Brake Attachments

Various types folders and brakes for company's press brakes pictured and described in 12-page Bulletin 74-B which also describes details of how these tools operate and shows samples of finished work accomplished. Niagara Machine & Tool Works, 637-607 Northland Ave., Buffalo, N. Y. **L-11-10**

Jigs

Folder illustrates and describes basic jig system for drilling, reaming, tapping, counterboring spot facing and grinding, emphasizing important economy of time and cost and consequent production improvement. Norco Basic Jig Systems, 39 Covington Rd., Buffalo 16, N. Y. **L-11-11**

Machine Tool Attachments

Leaflet No. 212 pictures and describes precision machine tool attachments including manual, air or hydraulic traverse, slides, feeds and tables for providing broad variations when attached to standard spindles or workheads. The Standard Electrical Tool Co., 2488-96 River Rd., Cincinnati 4, Ohio. **L-11-12**

Duplicating

Four-page illustrated leaflet describes portable device for duplicating on engine lathes; outlining broad range of work possible; also gives information on engineering and template services available from company. The D. C. Caufield Copy-Master, Manchester, Conn. **L-11-13**

Fire Protection

Illustrated 57-page manual, "Fire Hazards and Safeguards for Metalworking Industries," discusses the many phases of that field, pointing out hazardous situations and recommending preventive safety program; verified by many case histories of losses. National Board of Fire Underwriters, Research Dept., 85 John St., New York 38, N. Y. for the east, 222 W. Adams St., Chicago 6, Ill., serving the middle west, and 465 California St., San Francisco 4, Calif., serving west of the Rockies. **L-11-14**

Cylinders

"Cylinder Program for Automatic and Heavy Duty Service" stresses economies, convenience and versatility through use of air and hydraulic cylinders with drawings and tables to demonstrate points; discusses high degree of standardization possible. Miller Fluid Power Co., 2040 N. Hawthorne, Melrose Park, Ill. **L-11-15**

Blast Cleaning

Various models of Continuous-Flo Rotoblast barrels for production line blast cleaning described and illustrated in Bulletin No. 226. Contains information on construction features, operation, applications and resultant advantages. Pangborn Corp., Hagerstown, Md. **L-11-16**

Hard Facing

Comprehensive study of hard-facing, its application and advantageous characteristics presented in 72-page pocket-size booklet incorporating latest data and instructions on process; also includes information on company's own line of hard-facing metals. Contains special section covering recommendations of specific rods for specific jobs. Technical data section deals with questions concerning metallurgy. Mir-O-Col Alloy Co., 312 N. Ave. 21, Los Angeles 31, Calif. **L-11-17**

Industrial Slides

Literature describes line of industrial slides to facilitate selection of proper mechanism slide and most useful attachments; includes dimensional data and other pertinent information in tabular form. Grant Pulley & Hardware Corp., 3185 Whitestone Pky., Flushing 54, N. Y. **L-11-18**

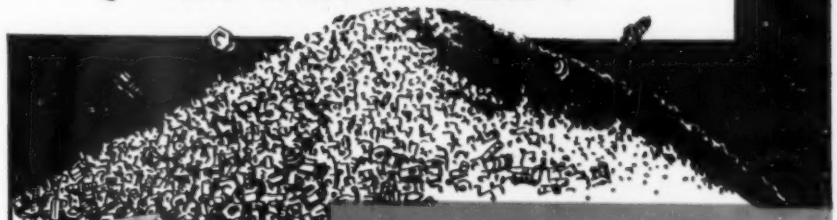
Gears

Line of instrument type precision gears available from stock discussed in brochure which includes data sheet which gives pertinent specifications of these gears available in 48, 64, 72 and 80 diametral pitch. Also describes gear design kits for experimental work. Dynamic Gear Co., Inc., Amityville, L. I., N. Y. **L-11-19**

Lubricants

Three illustrated brochures deal with company's industrial fluids, their applications, advantages of use, physical and chemical characteristics, performance in use. Booklets cover (1) water-mix cutting and grinding fluids, (2) cutting oil bases and (3) precision grinding oils. D. A. Stuart Oil Co., 2727 S. Troy St., Chicago 23, Ill. **L-11-20**

ARE YOUR PRODUCTION AND PROFITS GOING INTO THE SCRAP HEAP?



UP TO 80% OF YOUR PARTS REJECTS AND FIXTURE REWORK COSTS CAN BE ELIMINATED WITH THE VLIER AUTOMATIC TORQUE THUMB SCREWS

AVAILABLE IN FOUR TYPES

REGULAR —Type A for normal supporting

INVERTED—Type B Reverse of Type A support

TEE HEAD—Type C used with sliding V-blocks

ADJUSTABLE—Type D set your own holding pressures

HERE'S WHY—

VLIER Torque Thumb Screws are simple holding tools that give controlled support for even fragile work pieces against machine tool pressures. An automatic ball check in the head prevents further tightening once a pre-determined holding pressure is reached. Thus, no distortion—no rejects. These tools are operated by finger pressure only, and work without fail in noisy, greasy or dark places because they are *automatic*. Accuracy and uniformity are guaranteed and there is nothing to wear or break. It will pay you to apply VLIER Torque Thumb Screws to your production problem.

Send for Catalog No. 50

VLIER ENGINEERING, INC.
4552 BEVERLY BLVD., LOS ANGELES 4, CALIFORNIA
Distributors of Spring Plungers, Spring Stops, Fixture Keys, Toggle Pads.

FOR FURTHER INFORMATION, USE READER SERVICE CARD; INDICATE A-11-179

Field Notes...

Taking the lead in utilizing industrially a system of steel identification, Solar Steel Corp. has announced that it is converting to merchandising by the "accurate symbol classification system established by the Society of Automotive Engineers." Herman Rittger, general manager of tool steel sales for Solar, spoke for that independent warehouse chain, saying that selling and ordering tool steels by the thousands of brand names available results in waste and confusion.

Speaking before the Nashville chapter of the American Society of Tool Engineers, Mr. Rittger stated that the present practice of tagging similar and identical tool steels with many different brand names while selling them on the basis of special merits makes orderly and standardized buying impossible. SAE has classified tool steels into six major classes: water hardening, shock resisting, cold work, hot work, high speed, and special purpose. These six types are broken up into subtypes by letter and numeral, using performance and application as classification basis. At present, although there are actually no more than 30 or 40 different kinds of tool steel, a few thousand individual tool steel brand names confront the buyer.

V V V

Authentic reconstruction of America's first successful ironworks which operated at Saugus, Mass., 10 miles from Boston, from about 1646 to 1670, has been completed under the sponsorship of the First Iron Works Association, and financed by the American Iron and Steel Institute. Dedication ceremonies, in which Massachusetts' Gov. Christian A. Herter and top steel industry officials participated, marked the formal opening of the restored colonial ironworks to the public. The celebration formed the climax of more than six years of research and reconstruction.

Rebuilding, at a cost of more than $1\frac{1}{2}$ million, was accomplished in an effort to dramatize its historical and educational significance.

Restoration of the small ironworks serves to emphasize tremendous changes in the iron and steel industry that grew from this modest beginning to a business producing more than 124,000,000 tons of iron today. The original ironworks was a large-scale enterprise when it operated three centuries ago. Built just 25 years after the Pilgrims landed, it employed about 80 men and produced about 150 tons of cast and wrought iron a year.

V V V

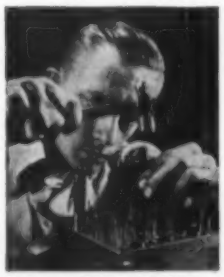
First presentation of the Presteel Award, which is to become an annual prize, has been made to D. S. Harder, vice-president of manufacturing of the Ford Motor Co., at the annual convention of the Pressed Metal Institute. The award was made by Worcester Pressed Steel Co. which is sponsoring it in cooperation with the Institute.

The honor this year was conferred on Mr. Harder for his contributions toward enlarging the field of metal stamping through encouragement of employee-training in order to provide more men skilled in pressing metal and through openly sharing his ideas with industry.

V V V

Highest honor of the die casting industry, the Doehler Award, has been made to Walter M. Goldhamer during the recent annual meeting of the American Die Casting Institute. Mr. Goldhamer, who is vice-president of the Superior Die Casting Co., was cited for conceiving and organizing the Die Cast-

"We started to make money when we installed our first Moore Jig Borer in 1936" SAYS AL STAUBER, MANAGING PARTNER, DACO MACHINE & TOOL COMPANY



Some were pretty small: All were very accurate...Die and Stripper for piercing 47 holes in stainless steel shutter stamping were jig bored and jig ground by Daco on Moore equipment. Hole location was within ±0.0002; hole sizes were held within ±0.0001.

Now Daco, one of nation's best-equipped tool and die shops, has 5 Moore Jig Borers and 3 Moore Jig Grinders

The toolroom which has at its disposal modern methods for fast and accurate hole location will take complex work in stride—*and make money*. Al Stauber proved that when he installed, in 1936, his first Moore Jig Borer at Daco Machine & Tool Company, Brooklyn.

Soon a jig grinder took its place alongside. Daco then had the perfect hole location partnership—the jig borer to locate and bore the hole accurately... and the jig grinder to relocate and grind it after hardening (and also grind contours).

Now famous for instruments and instrument tooling, Daco uses 5 Moore Jig Borers and 3 Moore Jig Grinders for 90% of its hole locating and a good percentage of its contour grinding operations. All have been operated at least 50 hours weekly the last four years; several, through two shifts. Daco also has two Moore Panto-Crush Wheel Dressers and a Moore Die Flipper.

You can prepare for tomorrow's competition *by writing today* for literature describing Moore Jig Borers and Jig Grinders.

Moore Special Tool Company, Inc., 732 Union Ave., Bridgeport 7, Connecticut

ADD MOORE TOOLS TO YOUR TOOLROOM

JIG BORERS • JIG GRINDERS • PANTO-CRUSH WHEEL DRESSERS • DIE FLIPPERS • MOTORIZED CENTERS • HOLE LOCATION ACCESSORIES

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Research Foundation. The Foundation is for metallurgical investigation of metals and processes affecting all branches of American industry. Primarily devoted to fundamental research in high temperature metallurgy, the organization aims to extend use of this nonferrous metalforming process to higher melting point metals such as copper, and eventually the ferrous metals.

V V V

A teaching laboratory in servomechanisms has been established at the Thayer School of Engineering at Dartmouth College. The step was made possible through the cooperative aid of the Diehl Mfg. Co. and a grant of $5,000 from the Ford Motor Co.

Purpose of the new teaching facilities is to train young engineers in design, construction and operation of servomechanisms or feedback control systems.

The laboratory will be under the direction of Prof. Charles Kingsley Jr., visiting professor from M.I.T. where he has been an associate professor of electrical engineering and research engineer in the servomechanisms lab there.

V V V

As part of its celebration of 50 years in the field, The Motch & Merryweather Machinery Co. has published a brochure outlining its history and achievements and acquainting the public further with its products, facilities, staff and operations.

expansions

Construction of a $250,000 addition to its home office and suburban warehouse has been completed by Interstate Steel Co. According to the company, the enlarged facility is so equipped as to provide 24-hour service on steel warehousing orders requiring no processing.

V V V

Two branch warehouses have been opened by Michigan Bearing Co. One, in Grand Rapids, Mich., will be managed by Robert Wyatt; the other, in Saginaw, Mich., will be managed by Robert Beckley, Jr.

V V V

Occupancy of its new Camden, N. J. plant is scheduled for November by the Samuel M. Langston Co. The quarter-million-dollar structure will provide additional shop space as well as house executive and sales offices.

V V V

New and expanded laboratories for Oakite Products, Inc. have been opened at 350 Hudson St., New York City. The laboratory is divided into three major areas: product development, customer service and engineering. In addition, a complete pilot plant is planned for small scale manufacture of detergents and solvents prior to extensive field testing. Each of these areas, which together cover a 30,000 sq-ft space, are equipped with the latest innovations.

company changes

According to an announcement issued jointly by the companies concerned, the Package Machinery Co. has offered to purchase the Reed-Prentice Corp. It is expected that should the transaction be completed, operations of the two companies will be continued separately in the present respective locations.

Negotiations for the purchase of Clearing Machine Corp. by Pressed Steel Car Co., Inc. have been completed. The acquisition fits in with Pressed Steel Car's five-year diversification plan which has recently placed it among the most diversified industrial concerns. Purchase price of Clearing will be between $9-million and $10-million, $5.3-million of which will be in new convertible debentures and the balance in cash.

V V V

All assets of Republic Gear Co. and its subsidiaries, Detroit Bevel Gear Co. and Almetal Universal Joint Co., have been acquired by The Gear Grinding Machine Co. According to the announcement made by the two companies concerned, the transaction involved an

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THE ROTOR B-7 VERTICAL
AIR GRINDER AND DISC SANDER
MORE POWER
PER POUND
than any other tool
of its type!
FOR sanding, cup wheel grinding, wire brushing, cut-off work.
FEATURES. Light weight... easy to handle. Positive, direct-acting governor... less maintenance, safer. Dead handle can be removed for fast, one-handed operation on "feathering" jobs.
Available with two types of handles... straight (shown above) or safety (shown at right).
Has automatic built-in oiler.
ASK FOR CATALOG 47
Here's the featherweight with the heavyweight punch.
AIR
SPECIFICATIONS
WEIGHT 6¾ lbs.
HEIGHT 7 inches overall
SPEEDS 8000, 6000 or 4500 rpm.
MODELS
B-7S (Straight Handle)
B-7SS
(Safety Straight Handle)
THE ROTOR TOOL CO.
CLEVELAND OHIO
HIGH CYCLE
AIR
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Mark

THE NEW YEAR WITH DATE STAMPS

by Parker

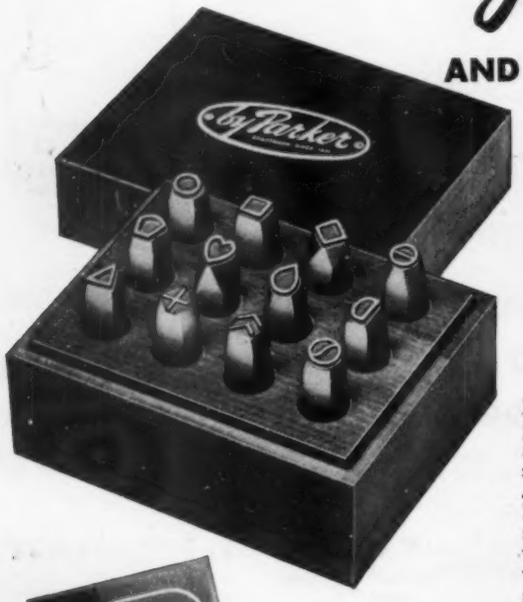
Parker date stamps are used throughout industry to permanently mark tools, products, assemblies with confidential date of production. Sets consist of 12 alloy tool steel date stamps, each bearing the key letter — which changes annually — that denotes the year and a number to indicate the month. Stocked in 1/16", 1/8" and 3/16" character sizes or custom made to specifications.

Inspection

AND SYMBOL STAMPS

by Parker

CLEARLY MARK PRODUCTION DATA . . .



For countless identification applications on virtually all materials, Parker inspection and symbol stamps mark quickly . . . easily . . . permanently. Designed for lifetime use, these stamps are furnished plain or with one, two or three numbers within the border. Available in standard sizes of 1/16", 3/32", 1/8", 3/16" and 1/4" or special symbol stamps may be exactingly reproduced in any quantity to your specifications.

The answer to every industrial marking problem will be found in "Marking Tools" — yours upon request.

THE PARKER STAMP WORKS, INC.
MARKING DIE & MACHINERY DIV.
FRANKLIN AVENUE • HARTFORD, CONNECTICUT

by Parker

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estimated $2,700,000 and includes all assets except certain items which do not affect operation. According to Edgar D. Leon, president of Geargrind, although his company will have control of the operation, the entire executive management team of Republic and its subsidiaries will be retained without any major changes of past policy.

v v v

Stockholders of Hydraulic Press Mfg. Co. on September 30 turned down the offer made by Frederick W. Richmond to purchase the company as reported last month in this department.

v v v

Formal affiliation with the West Coast division of the H and B American Machine Co., Inc., has been announced by the Karp Metal Products Co. The California plant, at 3420 Wesley St., Culver City, is already in operation manufacturing sheet metal products for western customers of the Karp firm.

new ventures

A Canadian wholly-owned subsidiary has been formed by The Colson Corp. The new organization, Colson Canada Ltd., will occupy a factory and warehouse in Toronto. Sales offices and display rooms for the casters and material handling equipment manufactured also will be located there. Roy D. Hill has been made vice-president and general manager of the subsidiary, and Edward A. Foley has been named its vice-president and sales manager. Both are experienced in Canadian industry.

v v v

First production warehouse in the Nashville, Tenn., area has been established with completion and operation of the new steel warehouse for Solar Steel Corp. The facility is completely equipped with the latest processing machines to provide the South's metalworking industry with steel processed to its production needs.

v v v

Formation of a new division has been announced by The Lees-Bradner Co. The new organization, called The Cri-Dan Div., was created to market and service the line of Cri-Dan high-speed threading machines. It will be headed by Fletcher Gleason, formerly chief processing engineer of Lees-Bradner.

v v v

The Electromold Corp. has been formed as an associated company by Stokes-Trenton Inc. for the purpose of

making cavities and other mold parts for plastic molds by electroforming process. The firm is located at 140 Enterprise Ave., Trenton, N. J.

v v v

Opening of a new factory in Toronto Canada has been revealed by Newage International Inc. The Canadian organization, known as Newage (Canada) Ltd., has three main sales and service divisions set up.

v v v

Glenn R. Bunnell has been elected president of Special Engineering Service, Inc. by the new owners of the company. The firm, at 8161 Livernois, Detroit, was recently purchased by 54 key employees with proceeds of an employee trust fund established 12 years ago, and maintained by the former owners from profits. Besides Mr. Bunnell, other members of the board now include John F. Langs, William J. Allar, Maurice Goehmann and Louis Seligman. Mr. Bunnell and Mr. Goehmann are members of ASTE's Detroit chapter.

sales

Two new district managers have been named by The Lincoln Electric Co. Robert J. Hirch who has five years' experience in the Pittsburgh district, now is sales manager in the North Haven, Conn. office. Richard P. Lindgren, who served as manager of the North Haven office, now is district manager in Moline, Ill.

v v v

Adamas Carbide Corp. has made public the appointment of William C. Harper, 7606 Reading Rd., Cincinnati, as its sales representative for southern Ohio and eastern Kentucky.

v v v

Andrew Liston has been made general sales manager of the Eddystone Div. of Baldwin-Lima-Hamilton Corp. after serving as manager of industrial sales for the company.

v v v

Former district engineer A. O. Wood has been promoted to the position of Chicago district manager for its Tocco Div. by The Ohio Crankshaft Co.

v v v

Frank M. Harbison has been named manager of sales, Warehouse Div., Jones & Laughlin Steel Corp. He had been manager of operations for the Warehouse Div.

Also announced by J&L was the appointment of Robert W. Walsh to the

Specify Morton
FIXTURE CLAMPS and COMPONENTS

UPON REQUEST
72 page informative Catalog including illustrations and full size tracing templates of each product.

SAVE TOOL AND DESIGN COSTS
Adopt Morton's Fixture Clamps and Components as STANDARDS. Largest range of sizes and types in the industry. Can be modified to whatever changes you specify.

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Buck .0005" PRECISION ...A FAVORITE with SUPERINTENDENTS

Buck AJUST-TRU
PAT. NO. 2,639,157
CHUCKS

Only universal scroll chuck with .0005" precision — for lathes, grinders, dividing heads, screw machines.

3-jaw and 6-jaw in 4", 5", 6", 7½", 9" sizes. 2-jaw Aviation chucks, for odd-shaped parts, in 6", 7½", 9" sizes.

ALSO SUPER-GRIP 4-JAW INDEPENDENT CHUCKS FOR 9" to 16" LATHES.

LOW COST PRODUCTION ON LATHES - GRINDERS

Buck Ajust-Tru 7½" chuck turns bar stock and shafts to consistent precision at The Set Screw & Mfg. Co., Bartlett, Illinois.

Shop superintendents everywhere report their satisfaction with the way these universal scroll chucks cut machinists' time, line up *dead true* in *one* minute, hold to within .0005" re-chucking precision on duplicate parts. Some report cost savings of up to 50% per operation. The Buck chuck ends most needs for stub arbors, mandrels, special fixtures . . . adapts to lathes, screw machines, grinders, dividing heads.

Make your next chuck a Buck. It will save money every time you use it. Send for latest catalog.

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Four Standard Thread Rolling Attachments

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For more than 100 sizes of machines

For more than 300 cross slide applications

Select the one you need...

Operating from the cross slides of automatic screw machines, each size of attachment is adjustable to accommodate an infinite range of work diameters within its capacity. Maximum thread rolling capacity within the tooling sector of over 100 sizes of single and multiple spindle automatic screw machines is possible through the selection of one of the four standard attachments. A large assortment of adapters are available that permit more than 300 cross slide applications.

Send us specifications of your requirements and let us supply you with complete information.

REED ROLLED THREAD DIE CO.

THREAD ROLLING MACHINES and DIES • KNURLS • THREAD ROLLS
Worcester, Massachusetts, U. S. A.

Sales Offices in: Buffalo, Chicago, Cleveland, Compton, Calif., Denver, Detroit, Englewood, N. J., Houston, Indianapolis, Milwaukee, Montreal, New York City, Phila., Pittsburgh, St. Louis, Syracuse, Toronto

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newly created position of sales manager of its New York warehouse. Although Mr. Walsh had been associated with J&L some years ago, he now rejoins the company from United States Steel Corp.

V V V

Earl J. Clark is the new general sales manager for Set Screw & Mfg. Co. During the past 20 years of experience in sales, Mr. Clark has served as sales manager for two national organizations.

V V V

Rotor Tool Co. has announced the promotion of Charles E. Vanderpool to the position of sales manager. He has been sales promotion and advertising manager.

V V V

Position of sales manager for The S-P Manufacturing Corp. has been filed with the appointment of David W. Davenport. Formerly assistant sales manager, he now takes over the sales manager's duties from D. Lee Bassett, company vice-president.

V V V

Territory of Kansas, Missouri and southern Illinois will be covered for Steel City Testing Machines, Inc. by The Dabar Industrial Sales Co., 5878 Delmar, St. Louis, which has been made its exclusive sales representative in that area. At the same time Steel City appointed Precision Tool Service Co., 5891 W. 76th St., Los Angeles, its exclusive representative in the Southern California area.

distributors

Production Service Co., 7413 Memphis Ave., Cleveland, has been named exclusive distributors for Detroit Broach Co. in the north eastern Ohio area.

V V V

Appointment of Size Control Co. and its affiliate, Wacker Sales, as exclusive agents for the line of portable Hardness testers has been announced by Riehle Testing Machines, division of American Machine and Metals, Inc. The territory concerned covers Iowa, northern half of Illinois and northeastern Indiana. Both sales firms are divisions of American Gage & Machine Co.

V V V

Kurt Orban Canada, Ltd., has been appointed exclusive stocking distributors for American Drill Bushing Co. for fast service to industry in Ontario.

Who's Meeting - and Where

Nov. 1-5. AMERICAN SOCIETY FOR METALS. Metal Show, International Amphitheatre, Chicago, Ill. Get more data from society headquarters, 7301 Euclid Ave., Cleveland, Ohio.

Nov. 1-5. AMERICAN WELDING SOCIETY. National fall meeting, Sherman Hotel, Chicago, Ill. Further details are available from society office, 33 W. 39th St., New York 18, N. Y.

Nov. 3-4. INVESTMENT CASTING INSTITUTE. National meeting, Congress Hotel, Chicago, Ill. For complete details contact institute headquarters, 27 E. Monroe St., Chicago 3, Ill.

Nov. 4-7. NATIONAL TOOL & DIE MANUFACTURERS ASSOCIATION. Annual convention, Biltmore Hotel, Dayton, Ohio. Complete information may be had from association headquarters, 907 Public Square Bldg., Cleveland 13, Ohio.

Nov. 11-12. GRAY IRON FOUNDERS' SOCIETY, INC. 26th annual meeting, The Homestead, Hot Springs, Va. Write for more information to society office, 930 National City-East Sixth Bldg., Cleveland 14, Ohio.

Nov. 15-17. AMERICAN STANDARDS ASSOCIATION. Fifth national conference on standards. Hotel Roosevelt, New York, N. Y. For more information, contact association headquarters, 70 E. 45th St., New York 17, N. Y.

Nov. 28-Dec. 1. AMERICAN SOCIETY OF REFRIGERATING ENGINEERS. 50th annual meeting, Benjamin Franklin Hotel, Philadelphia. Request details from society offices, 40 W. 40th St., New York 18, N. Y.

Nov. 28-Dec. 3. AMERICAN SOCIETY OF MECHANICAL ENGINEERS. Annual meeting, Statler Hotel, New York. Complete facts are available from society headquarters, 29 W. 39th St., New York, N. Y.

Dec. 7-8. THE SOCIETY OF THE PLASTICS INDUSTRY, INC. Fifth film, sheeting and coated fabrics division conference, Hotel Commodore, New York. Details may be had from society headquarters, 67 W. 44th St., New York 36, N. Y.

Which of these jobs gives you trouble?

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Oakite chemists have developed efficient new materials for the six important jobs listed below. One of these new materials may provide the perfect solution for your most difficult problem.

1 **HEAVY-DUTY CLEANING IN TANKS:** New material combines the best qualities of alkaline and solvent cleaners.

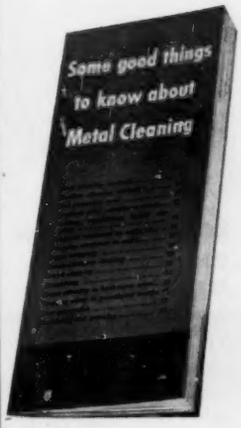
2 **PHOSPHATE COATINGS:** One material cleans steel while applying dense iron-phosphate coating. Another surpasses government specifications for heavy zinc-phosphate coatings. Lasting paint adhesion, protection against corrosion, ease of control.

3 **ETCH-CLEANING ALUMINUM:** Uniform etching in preparation for anodizing or painting. Scaling and sludging minimized or eliminated.

4 **ELECTROCLEANING BRASS:** Efficient, economical cleaning without danger of tarnish.

5 **INHIBITING PICKLE BATHS:** Liquid inhibitor for sulphuric, hydrochloric and phosphoric acids. Saves steel, saves acid, builds own foam blanket to suppress pickling fumes. Easy to add to continuous strip or batch pickling operations.

6 **STRIPPING PAINT:** Two solvent strippers for synthetic enamels and other tough finishes. One so viscous it adheres to vertical surfaces of objects that can't be stripped any other way.



FREE

Circle the coupon number corresponding to the job that gives you trouble. We'll send information about the new material for the work, also our 44-page illustrated booklet "Some good things to know about Metal Cleaning."

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Send me a FREE copy of "Some good things to know about Metal Cleaning" and tell me more about the new Oakite material for the job (jobs) corresponding to the number (numbers) I've circled below.

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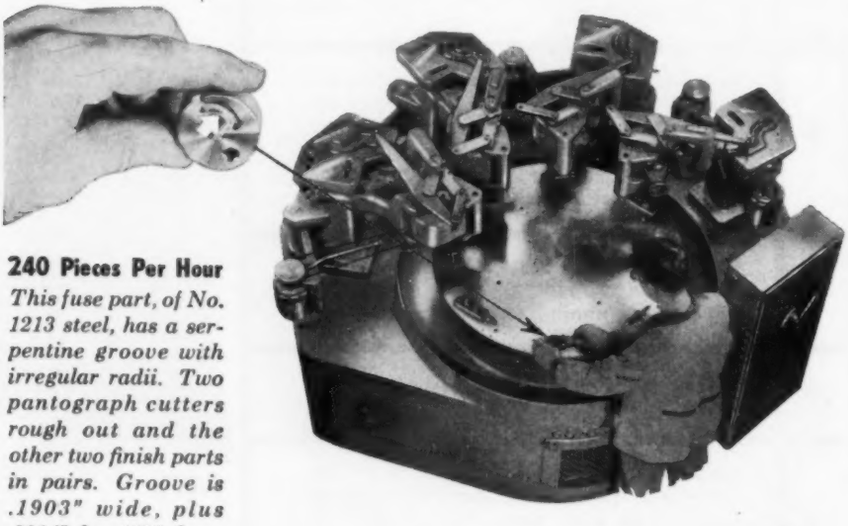
with GORTON MULTIPLE-SPINDLE INDEXING PANTOGRAPHS

Multiple operations with exceptional repetitive accuracy give you production-line performance on Gorton Multiple-Spindle Indexing Pantographs. From two to six different operations, performed at one setting, result in both precision and economy. Automatic cycling during engraving, milling, profiling, chamfering, counterboring, grooving or routing.

Infinitely variable feeds up to the capacity of any existing cutter. Reversing drive for conventional or climb milling.



240 Pieces Per Hour

This fuse part, of No. 1213 steel, has a serpentine groove with irregular radii. Two pantograph cutters rough out and the other two finish parts in pairs. Groove is .1903" wide, plus .0014", by .109" deep, plus .003". Finish: 35 mcr.

194 Pieces Per Hour

These die-cast spectacle frames incorporate "V"-shaped grooves or bezels for left- and right-hand lenses. The bezels do not lie in a horizontal plane but require a "rise and fall" in cutter movement to accommodate convex lenses. This machine mills grooves in both lenses automatically during the cutting cycle.

These machines are custom-built according to customers' specific requirements. With tooling changes, they have many different applications. Write for Forms 2595-DS2611 and 2604-DS2611 on Gorton Multiple-Spindle Indexing Pantographs.

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FOR FURTHER INFORMATION, USE READER SERVICE CARD; INDICATE A-11-186

good reading

REALISTIC DEPRECIATION POLICY *by George Terborgh. Published by Machinery and Allied Products Institute, 120 S. LaSalle St., Chicago 3, Ill. Price $6. 197 pp.*

This book presents an analysis of the course of capital consumption in relation to asset life. It measures lags inherent in existing write-off and accounting procedures and the deficiency of original cost depreciation due to price inflation.

Also provided in the book is a basis for management review of depreciation accounting methods and supplies reference material for courses in industrial and management engineering, graduate economics and business administration.

A SYMPOSIUM ON NON-DESTRUCTIVE TESTING. *Published by The American Society for Testing Materials, 1916 Race St., Philadelphia 3, Pa. Price $2.00 98 pp.*

This paper-covered book contains new non-destructive testing methods and techniques used throughout the world. Although the book discusses principally metal testing, data on plastics and other materials are given.

The text is illustrated with photographs of equipment, manipulative techniques, diagrams, charts and, where applicable, oscilloscope patterns.

PUMPS *by Frank A. Kristal and F. A. Annett. Published by McGraw-Hill Book Co., Inc., 330 W. 42nd St., New York, N. Y. Price $6.50. 373 pp.*

A range of pump applications is discussed in this book, including boiler feed, paper stock, deep well, sewage and sludge, chemical, food product, oil field, gasoline line, fire, corrosion and mine. Performance features are explained, as well as their service limitations. Also included are construction features, materials used in manufacture and details of operation of the various pump types.

ELEMENTS OF STRUCTURAL ENGINEERING *by Ernest C. Harris. Published by the Ronald Press Co., 15 E. 26th St., New York 10, N. Y. Price $7. 505 pp.*

Principles and applications presented in this text are largely those met by mechanical, electrical and other non-civil engineers. Bridge structures are omitted while examples of structural theory applied to cranes, conveyor supports, etc. are included.

Among the subjects discussed are: equilibrium and reactions, shear, thrust and bending movement, analysis of trusses and bracing, deflections in beams, and design in steel and timber.

HISTORY OF AMERICAN INDUSTRIAL SCIENCE *by Courtney Robert Hall. Published by Library Publishers, 8 W. 20th St., New York 18, N. Y. Price $4.95. 453 pp.*

The author of this book has interpreted a wide variety of facts on American industry in terms of national defense and possible future social and political developments in the western world. The plan of the book was to develop basic and inventive phases of larger categories of industry in their present state with speculations of the future.

THE SKILLED LABOR FORCE. *Technical Bulletin No. T-140. United States Department of Labor, Bureau of Apprenticeship. Price 45 cents. 52 pp.*

Included in this illustrated publication is information concerning the distribution of skilled craftsmen in industry, trade and locality; their ages and educational background, income and status; and growth trends of various crafts during the past 50 years.

Material is based on statistical material published by the Census Bureau over 5 decades. It was written for the layman and contains answers to questions asked by employers, vocational education authorities, and industrial researchers.

COATED ABRASIVES *by E. B. Gallaher. Published by Clover Mfg. Co., Norwalk, Conn. Price 25 cents. 36 pp.*

This illustrated booklet contains technical information in the field of coated abrasives. Among the subjects covered are: cloth and fiber backings, backstand belts, belt speeds, cartridge rolls, coating machines, disks and speeds, heat treating of grain, and methods of manufacture.

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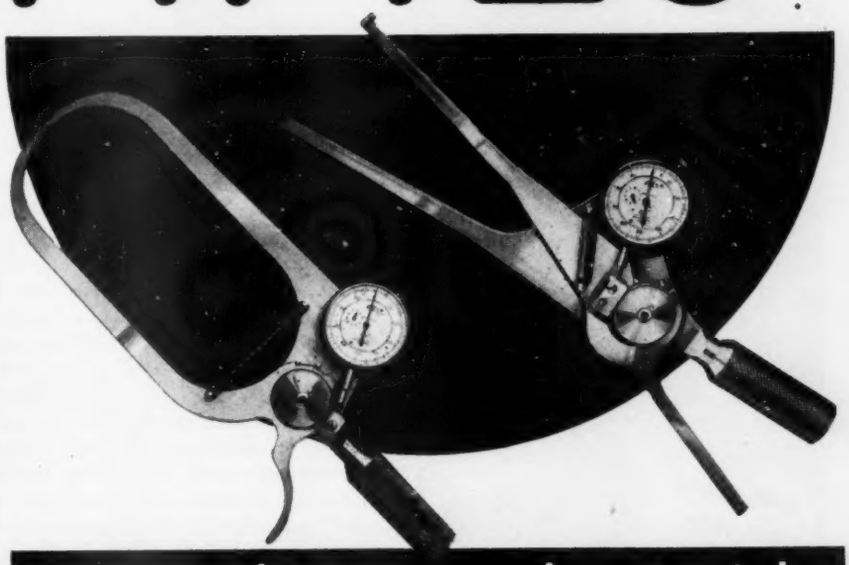

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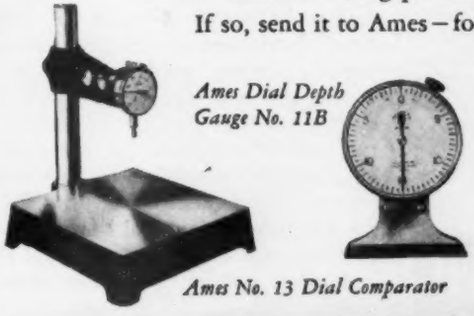

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abstracts of FOREIGN LITERATURE

By M. Kruesenberg
Consulting Engineer

Vibration and Tool Life

It has been known for some time that periodic variation in cutting speed have a detrimental effect on tool life. Such variations, causing vibration, are often invisible to the naked eye. They are the result of chip formation, the development and breaking of the built-up edge, elasticity of the machine and of many other causes.

A mathematical analysis of the relationship between tool life and a vibratory cutting speed gives some further theoretical evidence, as indicated in an article published in the August issue of *Werkstatt und Betrieb* by R. Weilenmann. His investigation starts with the Taylor equation for tool life and cutting speed in which the constant cutting speed v is supplemented by a factor representing the vibratory speed.

After mathematical integration of the basic equation the author obtains a relatively simple formula representing the relationship between tool life reduction and the ratio of velocity of vibration to cutting speed. From a graph developed from the formula it can be concluded that the tool life drops rapidly as the vibratory velocity approaches the cutting speed. (The author writes erroneously that the amplitude of vibration can reach the magnitude of the cutting speed which is, of course, impossible because the amplitude is measured in a length dimension and the cutting speed as a velocity in inches per min or ft per min.) He shows, however, that the magnitude of the tool-life exponent (n) has a great effect on the reduction in tool life under vibratory conditions. When $n = 0.2$ in the Taylor equation, tool life may drop to 20 percent of the expected tool life, and only to about 60 percent when $n = 0.4$.

One may conclude from the article that it is desirable to produce carbides and high-speed steels with a relatively high n for the tool life vs. cutting speed relationship because tools would be less

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adversely influenced by these invisible vibrations.

This analysis fails to include variations in the chip cross-sectional area caused by vibrations; they may modify the findings to a certain extent.

Meeting on Machine Tools and Metal Cutting

A meeting on machine tools and metal cutting was held in June 1954 at the Aachen Institute of Technology as reported by R. Dies in the same issue of *Werkstatt und Betrieb* as mentioned above. F. Kappel, the Secretary of the Assn. of German Machine Tool Manufacturers, discussed the situation of the machine tool industry in Europe, while H. Opitz contributed a report on the investigations on metal cutting carried out at the Aachen Insitute.

Several papers were presented on temperatures generated at the cutting edge. Hinnueber recommended keeping the temperature below 1450 F in the case of carbide tools to avoid heat concentration and corresponding failures at the cutting edge. Kuesters, also discussing tool temperatures, has developed a new method for determining the heat generated at any point on the tool face, while Axer contributed a report on the causes of tool wear. He has run tests, similar to tests run in the United States, using different types of gases as a cutting "fluid" to prevent metal to metal contact at the tool-chip interface. He came to the conclusion that nitrogen and argon, when applied under high pressure, improve tool life, while oxygen had the opposite effect.

Kattwinkel reported on radioactive wear tests which make it possible to separate wear at the tool face from the wear at the tool flank.

The second day of the meeting was reserved for presentation of papers on machine tools. Winstrom suggested that the machine tool designer should pay more attention to effective chip removal, while Moll criticized insufficient utilization of dead corners and of other places on machine tools for storage of tools and other equipment. He also emphasized the necessity of standardizing hydraulic and electrical accessories. Frey, Switzerland, discussed special machine tools that permit a quick changeover from one type of production to another and demonstrated his ideas by means of slides of a vertical boring mill.

Cost Data on Cutting with Carbide Tools

Increase in feed rate combined with a reduction in speed is often recommended for cost reduction when machining steel with carbide tools, ac-

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cording to an article by J. Witthoff, published in issue No. 4, 1954 of *Technische Mitteilungen Krupp.*

The author made a study of the economics of carbide cutting paying particular attention to the manufacturing time per piece, tool cost per piece and manufacturing cost per piece. In addition to discussing the specific conditions of individual cases he also compares several machining methods. In milling slots in large rotors it was found that the cost per slot was substantially less with carbide cutters than with high-speed steel cutters, and also depended to a certain degree on the number of slots cut between grinds.

Many charts and tables are given on more general findings. For example. overhead on tools averaged 25 to 50 percent in turning operations, 80 to 150 percent in milling cast iron parts and 150 to 250 percent in milling steel, when a single cutter was used. Overhead increased, however, to as much as 245 percent in turning operations and to 1610 percent in milling steel when several tools had to be employed simultaneously.

The cost per piece when machining steel similar to SAE 1045 dropped from about 15 to 7 cents when the cutting speed was reduced from 450 to 260 ft per min while increasing the feed from 0.008 inch per revolution to 0.064 inch per revolution. The reduction in cost, however, is not proportional to the increase in feed as indicated by the fact that the cost per piece dropped to 8¼ cents at a feed of 0.032 inch per revolution combined with a cutting speed of 280 ft per min. Hence, it is concluded, that a limit exists for the feed increase where optimum conditions prevail.

Another comparison concerns the cost per pound of chips produced with carbides of different grades. With grade TT 4 (German Standard) having a Vickers Hardness Number of 1300, the cost per pound of chips was 3 cents. Using grade TT 3 (Vickers Hardness Number 1500) the cost dropped to 2.4 cents, reaching a minimum when cutting with grade TT 1 (Vickers Hardness Number 1600) of 1.5 cents per pound of chips.

These data apply to cutting with a constant feed of 0.016 inch per revolution. On the other hand, it was found that the Vickers Hardness—that is the grade of carbide employed—had almost no effect on the cost per pound of chips produced when the maximum feed suitable to the respective grade of carbide was used.

The author concludes that the relationships involved in these problems are complex and require further research so technical and the economical factors can be considered.

technical digests

Impreg Improves Patterns and Die Models

by Ray M. Seborg

Chemist
Forest Products Lab. Forest Service
U.S.D.A.

and

A. E. Vallier

Manager
Experimental Fabricating Dept.
Engineering Staff, Ford Motor Co.
Dearborn, Mich.

SHRINKAGE AND SWELLING of wood in die model applications present a serious problem in many industries. Tests conducted so far show that about two-thirds of the dimensional changes that occur in patterns and die models can be eliminated by the use of impreg. The wood industry has been slow in adopting this process. This fact may be due partly to the relatively high costs of the treated wood which has been produced primarily for rather specialized applications.

The Ford Motor Co. sponsored research project at the Forest Products Laboratory was aimed at determining the suitability of using impreg for making of die models and patterns. While properties of impreg, in general, have been well established, the effect of phenolic resins on mahogany for this particular application was unknown. Tests were therefore made to determine the effectiveness of resin impregnation in reducing dimensional changes of the veneer, the laminated panels and the completed die models. The effect of resins on the gluing and carving properties of this material was also ascertained.

The effect of varying amounts of resin on reduction in swelling from ovendry to water-soaked conditions is shown in *Fig.* 1. The resin content was based on the weight of the untreated ovendry wood. Dimensional stability improves with increase in resin content up to approximately 30 percent, at which point a reduction in swelling of 50 to 55 percent was obtained. Additional amounts of resin give no significant improvement in stabilization.

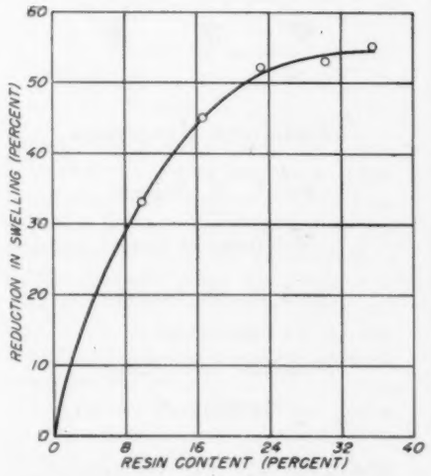

Fig. 1. Effect of resin content on the reduction in swelling of mahogany veneer between ovendry and water-soaked conditions.

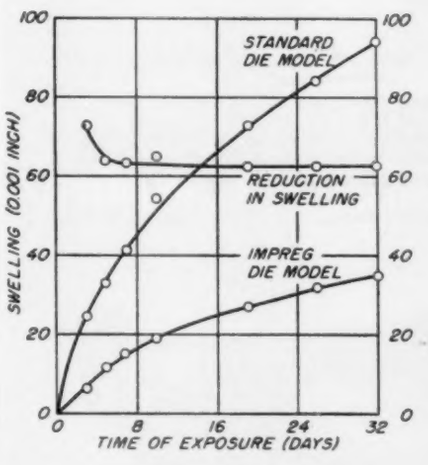

Fig. 2. Comparative dimensional changes of conventional die model and one made of resin-impregnated laminated lumber.

A conventional model and one of impreg were subjected to 90-percent relative humidity at 80 F for a month and to 30-percent relative humidity for the same length of time. Comparative dimensional changes of two die models when subjected to 90-percent relative humidity are shown in *Fig.* 2. Each value represents the average of measurements made at 24 different positions on each model. Results show that a 65-percent reduction in swelling was obtained in the impreg model. Similar values for reduction in shrinkage were obtained when the models were subjected to 30-percent relative humidity.

The irregular surface, resulting from swelling during exposure to 90-percent relative humidity can readily be observed on the end section of the standard model, *Fig.* 3. This irregular surface (indicated by shadow lines) is the result of differential swelling of the adjacent boards in transverse and longitudinal directions. No surface irregularities are noticed on the impreg model.

Die model and pattern shops in the Chicago, Milwaukee and Detroit areas made experimental models from this new material. From their experience, there is no indication of more difficulty in making models from impreg than from conventional mahogany. In fact, there is every indication that it will be easier. Generally no increased dulling of the tools was experienced while working with this new material and the surface of the models made from impreg is easier to sand to a smooth finish than the surface of the models made from conventional mahogany.

Several die models for 1956 production have been made from this material and they are now at various tool and die shops where the hard dies are being kellered from them. No difficulty is being experienced. Use of models from this new material will enable the tool manufacturers to take from the die model as many plaster or plastic casts as desired without change of di-

mension or extortion of the original model. Also, from a practical usage standpoint the model will be dimensionally stable throughout its life.

Making die models from this material will also afford the automotive greater use of duplicate plastic die models. The reason is that the original impreg model will not change dimensionally due to the application of plastic over it.

Ford Motor Co. has made wood crankshaft patterns from impreg for experimental shell-molded crankshafts. In this application, advantage is taken of both the dimensional stability and heat resistance properties of this material, as the pattern is heated for an hour to 400 F before the mixture is set and resin applied. Shells obtained are satisfactory and the use of impreg in this experimental application appears promising. Also, the company is experimenting with impreg for the construction of other types of wooden patterns. From this experience, it is believed that impreg will eventually replace conventional mahogany and other woods in the construction of virtually all types of patterns.

Undoubtedly impreg boards will be higher in price than conventional mahogany boards of the same dimensions. Comparisons between board costs are misleading, however. Lumber used in a die model or pattern is a small percentage of the total cost, the greater portion being allocated to skilled labor. Also, less board feet of impreg is used since it is a finished board rather than rough lumber. Approximately 20 percent or more of the major cost of a die model is spent in correcting dimensional movement during construction, which use of impreg will eliminate. Impreg used to date has been made on pilot or experimental equipment. When impreg is available in commercial quantities, finished die models and patterns made from it should be comparative in total cost with models and patterns made from conventional mahogany.

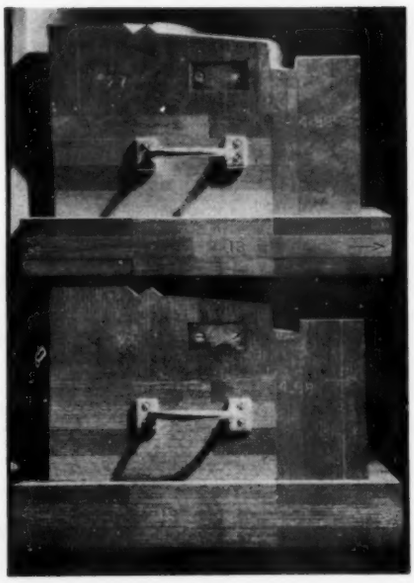

Fig. 3. End view of conventional (top) and impreg (bottom) die models shows superior dimensional stability of the latter.

From a paper presented at the annual meeting of the Forest Products Research Society, Grand Rapids, Mich., May 5, 6, 7, 1954.

▼ ▼ ▼

Titanium Progress

by T. E. Perry

Metallurgical Dept.

and R. J. Garmy

Engr. Dept.

Republic Steel Corp.

Massillon, O.

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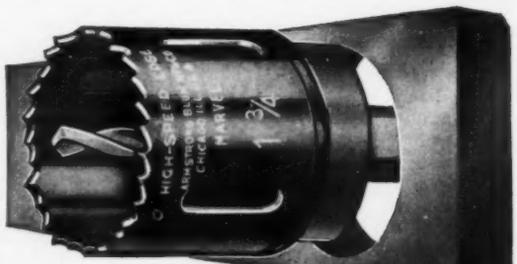

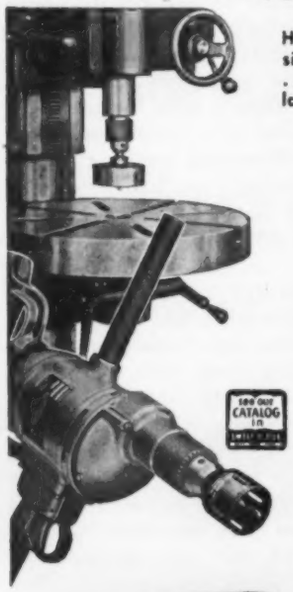

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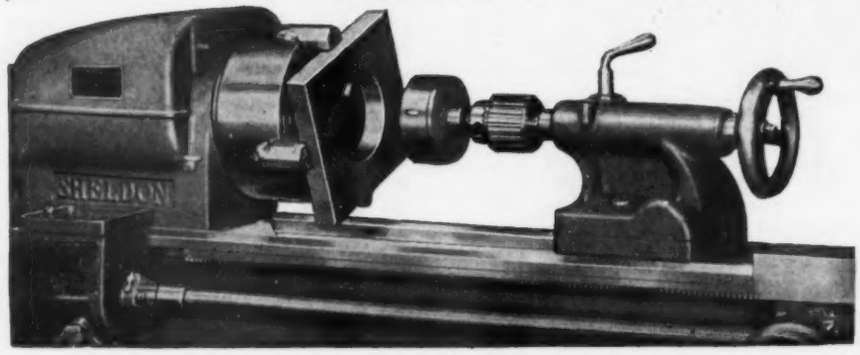

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developed which are weldable and which are heat treatable to as high as 200,000 psi ultimate strength with good remaining ductility. Parameters of usefulness are becoming better defined with increased usage and improved product quality. Industrial growth of titanium is based largely on four principal characteristics of this metal: availability of plentiful domestic ore reserves, its light weight, high strength and corrosion resistance.

Titanium is playing an increasingly large role in swinging the balance of power in the air in favor of the United States. A major part of all titanium produced is serving in this capacity. Adaptability of titanium to ordnance equipment may govern to a large extent not only the striking power, but the ability to deliver tomorrow's air-dropped armies. In nonmilitary applications, such as chemical plant and food processing equipment, titanium is already paying its way—sometimes in a spectacular manner, as a corrosion resisting structural metal. It is being used with remarkable success as orthopedic devices. When the first rocket ship touches the moon it will probably be made largely of titanium.

Basic types of melting furnaces are discussed in the form of a reference chart as an aid to visualizing both the progress and some of the problems in this still highly specialized phase of the industry.

From a paper presented at the 1954 Annual Convention of Assn. of Iron & Steel Engineers.

▼ ▼ ▼

Load Indicators Guide Use of Machine Tools

by D. C. Russ, Jr.

Meter Division
Westinghouse Electric Corp.
Newark, N. J.

Measuring varying loads on a machine tool can guide the use and application of the equipment to a considerable degree. Load indicators are often thought to be merely devices to tell the operator when the machine is being overloaded. Actually, there are three main functions to be accomplished by load measurements: control, protection and analysis.

By properly controlling the operation the optimum safe output can be obtained from all components. It is also desirable to keep the load within safe limits so that operation of protective devices is unnecessary.

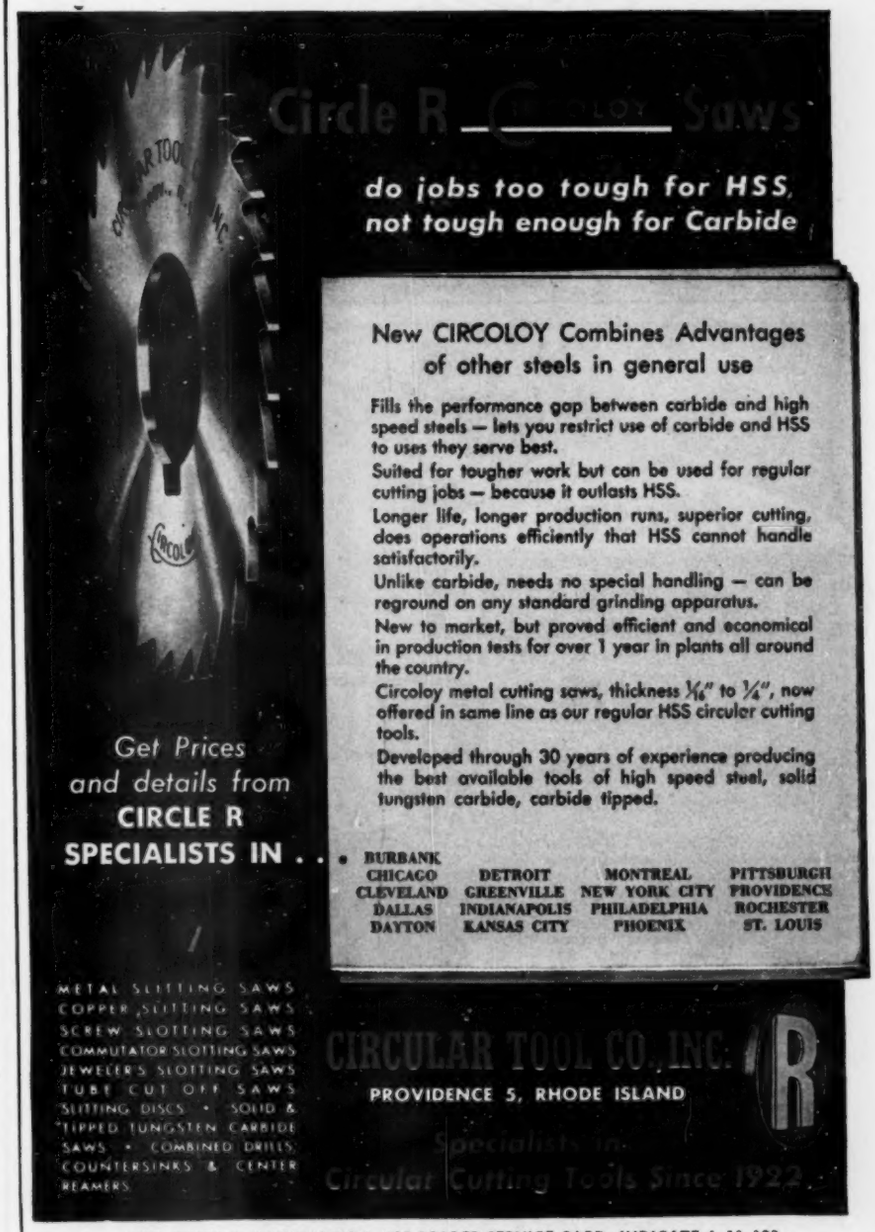
Protection covers the safeguarding

Fig. 1. Recording meter on machine tool facilitates efficiency studies.

of machine, operator and work. This mainly concerns overload protection, to avoid straining or damaging the elements of the tool or the work. Analysis refers to the study of the process by operation, cycle, utilization of available resources, overloads experienced, lost time and lost motion, *Fig.* 1. During the process functioning of various elements are studied whether or not the work is being properly treated.

In operations where all other variables are fixed, such as automatic lathes or boring mills, indication of an instrument will indirectly warn of increasing dulling of the tool, since the load will increase as the tool loses its edge. This would make it advantageous to have an indicator on a machine even if not used for a continuous operating check, since periodic readings would show changes during operation.

Protection is commonly accomplished by means of fuses, breakers, and other protective devices, but an indicating instrument can be useful since it will warn of overloads before the automatic devices operate, thus maintaining continuous operation. If the protective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function is not performed by the operator, the tool or work may be damaged, work on the machine will be held up, and conceivably other phases of operations will be affected.

Analysis may be accomplished by means of periodic reading of an indicator or, more conveniently, by means of recording instruments, *Fig.* 2. A continuous chart of current or power

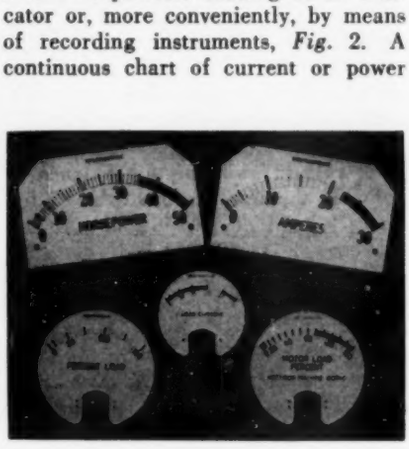


Fig. 2. Various meter dials in current use for machine studies.

will show down time, percent utilization, amount and duration of overloads, and give a picture of the complete machine cycle.

From a paper presented at the 1954 Machine Tool Electrification Forum, sponsored by Westinghouse Electric Corp.

▼ ▼ ▼

Management of the Automatic Factory

by Douglas Watson

McKinsey & Co.
San Francisco and New York

Practical, profitable operation of a facility for automatic production of electronic equipment raises some entirely new management problems and places a different emphasis on some of the older ones. Not only are the entire production processes different from those typically encountered, but the management atmosphere must also be quite different if the automatic factory is to succeed commercially.

Of necessity, problems of organizing and operating the automatic factory must be approached from the point of view of its long-term profitability. This means that a financial common denominator must be developed on which to forecast, to organize, and to appraise success. Recognizing that the application of automation techniques frequent-

ly means product redesign, ramifications in the field of management redesign should also be considered.

Through the automation process, quality is frequently improved and direct labor costs substantially reduced. This is done, however, at the expense of increasing organizational costs and raising break-even points. In order for the automatic factory to be profitable, therefore, there must be an unfluctuating high level of production. Mechanically, this means more perfection in process, because the effects of process down time are geometrically cumulative in the automatic factory. In the management sense, this means planning-orientation and improvement in abilities at making plans and forecasts come true.

In the more typical electronics manufacturing plant, management can compensate for variations in volume or for product design changes through regulating the working force, *Fig.* 1. In the automatic factory this opportunity is denied, *Fig.* 2. Other means must

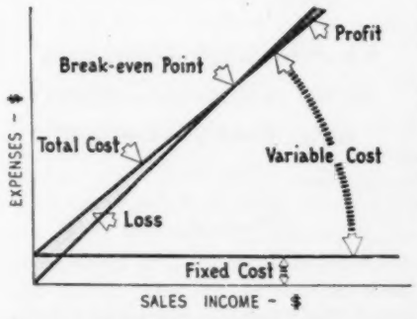
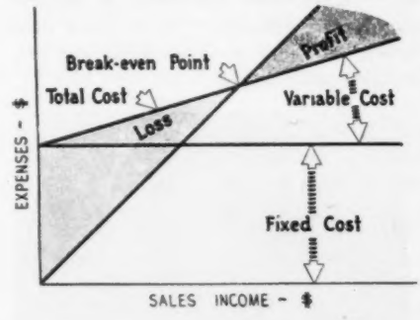


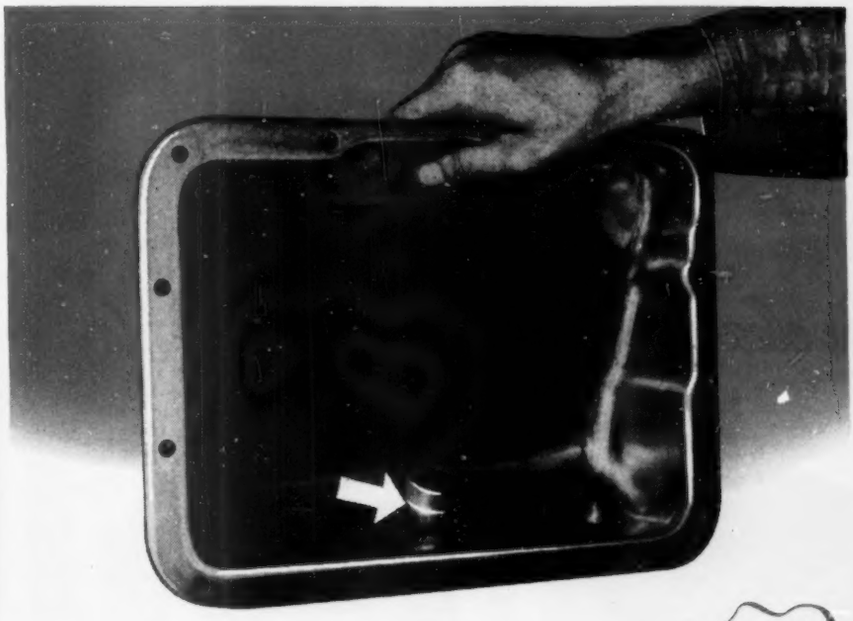
Fig. 1. Operating characteristics of a nonautomatic electronics factory.

Fig. 2. Operating characteristics of an automatic electronics factory.



therefore be found. There will be a greater need for more accurate management control information—in the areas of production, quality and costs.

Management will have to act more quickly when operations go out of control, for the cost of procrastination will be extremely high. This will have further requirements organizationally



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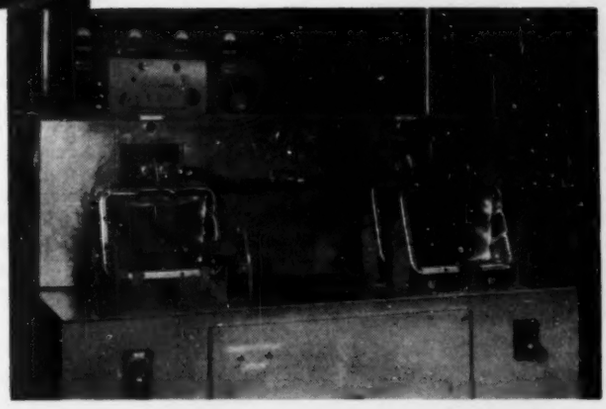

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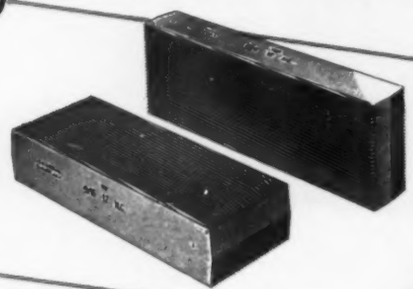

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where new and improved concepts must be applied. Technical and operational organizations will have to work together in a sense not now found, except in some highly automatic process industries.

This close relationship poses some interesting management situations in terms of fixing responsibilities for profitable operation. The solutions to these lie in the area of clarifying how the automatic factory should operate—not in the technical sense, but in the management or operational sense. These, then, are the keys to successful operation of the automatic factory. Once the technology is known, then the management of that technology becomes the important thing. The management job is as different as the differences in technological approach, however, and must be patterned to the conditions of the automatic factory if the whole is to succeed.

From a paper given at the 1954 Automatic Production Symposium sponsored by Stanford Research Institute and USAF, San Francisco, Calif.

▼ ▼ ▼

Electrospark Removes Metal without Contact

By C. Paul Porterfield

Vice Pres.
Method X Co.
Pittsburgh, Pa.

Electromachining can be divided into basic groups as follows: contact initiated discharge, electrolytic and spark initiated discharge. The third process utilizes the breakdown of a dielectric to initiate a spark discharge. Unlike the first two the tool or electrode makes no contact with the work to achieve machining efficiency. If the tool does touch the work it slows down the machining action, *Fig.* 1.

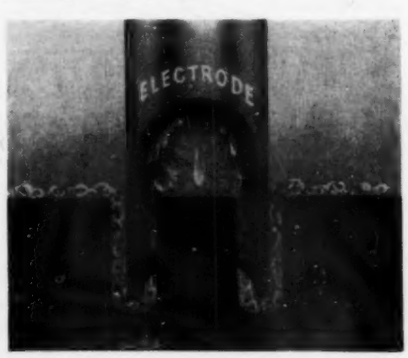

Fig. 1. Shaped electrode bombards work-piece, dislodging metal particles which are floated away by dielectric fluid.

Electrospark machines consist of a well regulated source of d-c power connected through a charging circuit to a capacitor, *Fig.* 2. The terminals of the capacitor are connected directly to the tool and work. The work is submerged

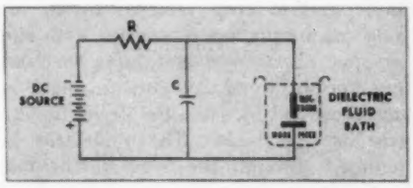

Fig. 2. Basic circuit diagram for an electrospark machine as used by Lazarenko and Teubner.

under a dielectric bath, usually a hydrocarbon, and the tool approaches the work along a predetermined axis by a movement of the toolholder.

In its simplest form this type of machine strongly resembles a drill press except for the dielectric tank at the base of the machine column which contains the table that supports the piece to be machined. The polarity of the d-c source is so selected that the tool is negative and the work positive.

In actual practice, utilizing this type of machine, the voltage of the d-c source may vary from 75 to 400 volts. Normally the higher voltages are associated with a so-called roughing cut and voltages of the order of 100 volts are used when making a finishing cut. The value of the capacitor will also vary with the type of operation, the larger capacities being associated with a roughing cut and the smaller values with a finishing operation. The feed during the cutting operation is, of course, of prime importance and is usually accomplished through a servo-drive. The servo-drive often obtains its error information from the average voltage that occurs between the tool and the workpiece.

Calculations reveal that forces could be produced in excess of that required in the machining of any metal now available.

Information obtained in the single discharge research program was applied to the design of the cutting power generating unit. Components were selected that would provide a compromise between speed of cut and surface finish. The duty cycle of the machine was so adjusted as to make it fit the majority of machining requirements. This combination of components produced a machine that answered the requirements of general purpose service.

In electrospark machining, as in any

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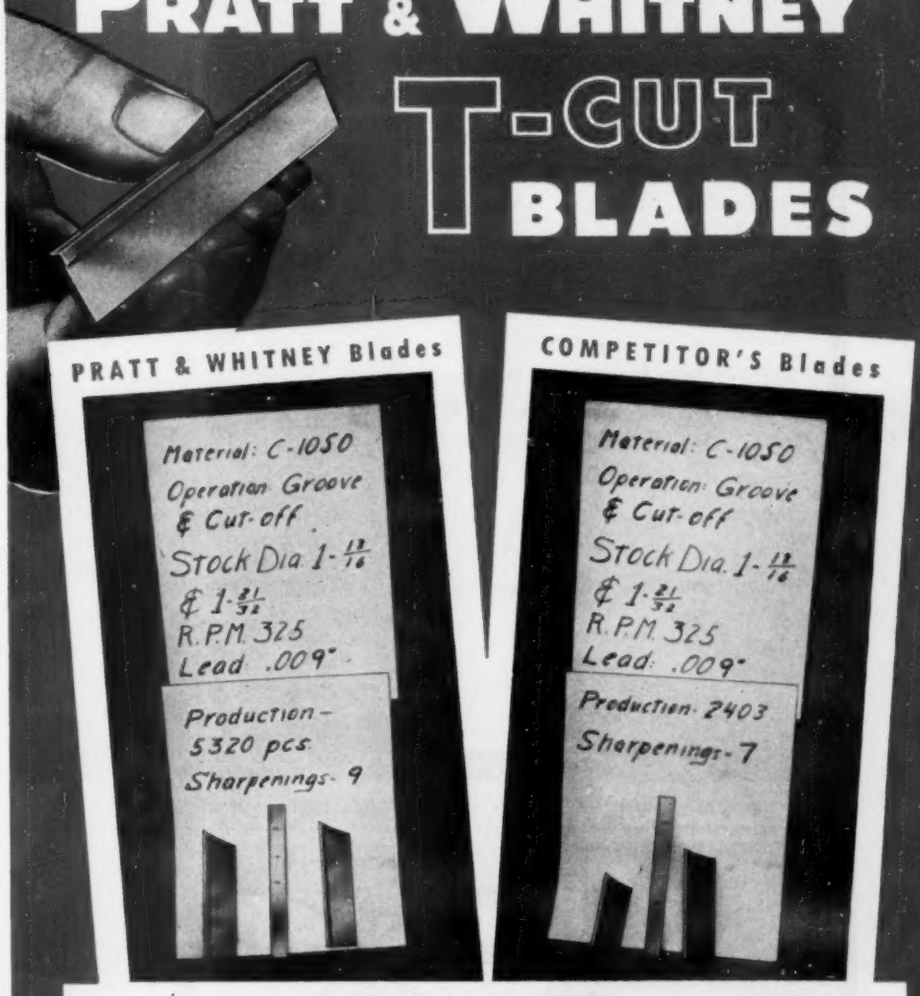

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other type machining operation, the removal of chips or displaced material that results from machining presents a limitation to the speed with which an internal contour can be produced or a hole can be drilled. Repeated test cuts indicate that chip removal in an inside machining operation presents the greatest obstacle to increasing machining speed. Normally chip removal is accomplished by using the liquid dielectric as a vehicle. The dielectric is pumped through the area of the cut and in its passage it picks up the chips and carries them away. Even with this limitation, however, test machining using the electrospark method to produce internal shapes demonstrates rates of metal removal in sintered carbides that are a multiple of the rates achieved by standard machining. Investigation is now in process to determine flushing techniques that will assist in the chip removal problem and further increase speed.

Simultaneously with this investigation, another group is examining the application of the process to grinding or milling operations. It now appears that the original conception of electrospark machining should be modified to include these operations. Preliminary results of this program reveal an ease of material removal as a result of the absence of difficulty in removing debris while performing an outside machining operation. The fact that the removal of chips offers no barrier in outside machining leads to the conclusion that sharply increased rates of metal removal may be expected.

From a paper presented at 1954 Machine Tool Electrification Forum sponsored by Westinghouse Electric Corp.

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Vacuum Injection Molding

by George Lubin

Director of Research
Bassons Industries Corp.
New York, N. Y.

This new molding method was devised specifically to help solve problems of reinforced plastic industry in making large parts inexpensively. The process involves use of matched molds with male mold mounted in a trough and the female having one or more vacuum outlets at the top as illustrated in *Fig.* 1. A preform of fiberglas or fabric or a combination placed on the male mold. The female mold is then lowered on it. Usually some clamping action is used

to provide initial squeeze and prevent misalignment.

A room setting resin formula mixed to set in 30 to 60 minutes, is poured into the trough and the vacuum turned on.

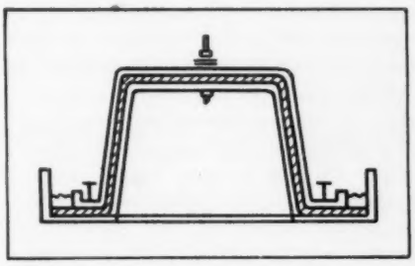

Fig. 1. Vacuum injection mold.

The vacuum holds the resin up from the trough, saturating the reinforcing material up to the vacuum port. Usually only 8 to 12 inches of mercury vacuum is required. Higher vacuums cause bubbling and excessive evaporation of styrene in polyester resins. The resin usually rises uniformly through the mold and if the preform is well-made, impregnation is thorough and effective.

When the resin reaches the top of the mold and begins to flow through the sight gage, air trapped in the preform shows up as bubbles. When these disappear, the line is clamped shut, vacuum turned off and the resin allowed to set.

Molds may be of metal, plaster or reinforced plastic. The main requirement is that they must be porous and must have smooth internal surfaces.

Advantages

Use of vacuum injection molding makes possible production of large and complex parts on inexpensive molds. Parts produced are free porosity and it is possible to readily make moldings with ribs, internal reinforcements and thickness variations. One-piece hulls as large as 36 feet have been made by this method which are superior in many respects to fabricated metal equivalents. Other parts readily made with this method are radomes, arctic sleds, huts and truck side panels, tanks of all sorts, jet engine containers, sinks, bathtubs, panels, etc. The method is ideally suited for prototype manufacturing as well as limited production of large parts where design changes are anticipated, because molds are inexpensive and can readily be modified. Large parts with critical inside and outside surfaces require a great amount of finishing if hand laid up, can be vacuum injection molded. Surfaces come out finished and require

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only trimming of flash after removal of the mold, *Fig.* 2.

The method allows reproduceable parts to be made on a production basis. Glass and resin content can be accurately controlled, and by use of low exotherm resins, high dimensional stability is possible.

Chief disadvantage of vacuum injection is time required to lay-up and mold each part. This is the primary factor limiting it from effective use in large scale production. There are other production disadvantages such as the tendency of the resin to channel unless the preform is well tailored. Another disadvantage is the difficulty in obtaining a high glass to resin ratio. For parts requiring fast production cycles, use of matched metal compression molds is more advantageous. Higher pressures obtainable with these molds increase mechanical strengths of parts and less care is required in making up preforms.

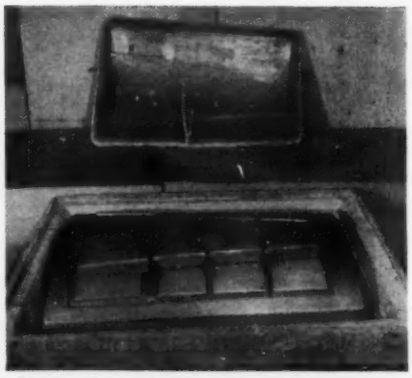

Fig. 2. Airplane part mold open.

From a paper presented at the Technical and Management Conference of the Society for Plastics Industry, Inc., February 1954.

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Improvements in Semi-Automatic Welding and Hard Facing

By Howard S. Avery, Turner G. Brashear, Henry J. Chapin and Gerald H. Edmunds

American Brake Shoe Co.

A new device that combines the advantages of automatic welding with the visibility and flexibility of manual welding is described. Electrode wire from coils is fed continuously, reaching the arc with a flux covering that serves the need for arc shielding, deoxidation, arc stabilization, slag coverage of the molten bead and alloying if necessary. The operator can weld steadily for ten minutes if necessary; the delay of replacing electrodes and the waste of stub ends are eliminated. The concealment of the arc and the nuisance and expense of handling unfused flux are avoided.

The range of filler metals is also rents and burn off rates is wide. The automatic control of arc length makes the device easy to operate. The chief limitation of the device is the adaptability only to down hand welding, in the same way that submerged arc welding is restricted. Inexperienced operators can learn to handle it in a few minutes.

The range of filler metals is also wide. Fluxes are being developed that will deposit mild steel of the E60 series type, higher yield strength build-up steels, martensitic steels for wear and impact resistance, martensitic irons for abrasion resistance and austenitic manganese steel with the same roll of electrode wire. It requires only a few seconds to change from one type to the other and no waste of flux or electrode is involved.

From a paper presented at the 2nd annual welding show and 1954 spring meeting of the American Welding Society.

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Area or Centralized Maintenance?

By J. B. Gibbons

Plant Engineer
Aircraft Gas Turbine Div.
General Electric Co.
Evendale, Ohio

A modern industrial plant resembles a human body in many respects. It is an integrated mechanism designed for work. Its communication system is much like a nervous system, and its utilities resemble a circulatory system. There are usually several specialized sections, which, like various human organs, perform specific functions; and each of these sections has its own methods and machines to achieve its purpose. It is the maintenance section's responsibility to keep the whole thing working efficiently.

Assignment of maintenance responsibilities in the Evendale Plant gives to the production people those things which they must control in order to accomplish their job and gives to centralized maintenance those things which are better done by a central group.

The 13 buildings comprising the plant are occupied by three operating departments. Each of these departments is a business, responsible completely for its own profit and loss and is therefore given, along with the responsibility, the authority to organize and operate as it wishes consistent with the company's over-all policy. Inasmuch as each department is responsible for its operation, it was felt that it was necessary for each department to do its own maintenance of production facilities: machine tools, stock rooms, materials handling, etc., that are directly tied into producing the product. Having these decentralized maintenance specialists in the area where the problems occur permits quick action, simplifies paperwork and enables the operating departments to keep their own records.

On the other hand, there are utilities and maintenance functions which are common to the plant and which would be difficult to divide into three pieces. These are the responsibility of the central maintenance group, which is attached to one of the operating departments. This central maintenance group has been given the responsibility for utilities such as the steam plant and air-supply system, the water-softening plant, the power substation and the gas reducing station. They are also responsible for the main utility services in the buildings, such as the steam mains, the electrical power distribution for the grounds and building structures.

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The operating departments are responsible for maintaining the utilities from the main distribution lines to the equipment and for the equipment itself. They are responsible for internal building services, such as janitor services, replacement of lights, rest-room maintenance, etc. The operating departments, therefore, are staffed with those maintenance people necessary to do the day-to-day routine maintenance of productive equipment and its related services, but they are not staffed to take care of emergencies.

The central maintenance group staffs for their day-to-day maintenance of the grounds and buildings, and in addition maintains a work force of specialized trades which the operating departments would not normally carry, such as carpenters, millwrights, iron workers and painters. These people serve as a pool of talent to meet emergencies which cannot be handled by the operating departments' routine maintenance personnel.

Operating departments are responsible for setting forth the design criteria, securing architect engineers' design services, and letting contracts for construction and the purchase of equipment. They are also responsible for making the proper arrangements and coordinating with the plant engineer's office for plot location, utilities, fire protection, and security. The plant engineer maintains a staff of construction engineers, specialists in the fields of mechanical, electrical, structural, and air-conditioning engineering. Thus, this group is available for the design and construction for small jobs which occur from day to day and consist of such things as the design and construction of truck docks, employees' stores, structural reinforcement for conveyor equipment, etc.

This system is neither area maintenance nor centralized maintenance, but a combination of the two based on the physical situation, the plant organization and the primary importance of production as represented by the operating departments. It is felt any decisions concerning the desirability of either of the two types of maintenance must be similarly based on the consideration of local problems.

The combination of systems works out well and in a plant with similar problems, where multiple autonomous departments are to be provided with those services necessary to complete a production job, a similar organization might be feasible.

From an address given at the 1954 Plant Maintenance and Engineering Conference, Chicago.

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1. *Cuts labor costs.* No hand starting, no pre-positioning of screws. Bit holds screw *firmly.* High energy *permanent* magnet energizes bit with 10 times ordinary "pull".

2. *Cuts bit costs . . .* through use of long-wearing super hard, low-cost interchangeable insert bits.

3. *Cuts bit wear* and replacement since the energized bit seats itself positively in the screw slot or recess.

4. *Eliminates* loss of time and material caused by dropped screws.

Bit holders available for all makes of power and spiral drivers. Also super hardened tool steel insert bits for all types and sizes of screws.

Permanently Magnetic Magna-Tip Hand Screw Drivers*... bits for all types and sizes of screws and Magna-Tip Hex Drivers for hex head screws.

*U.S. Patent No. 2,550,775.

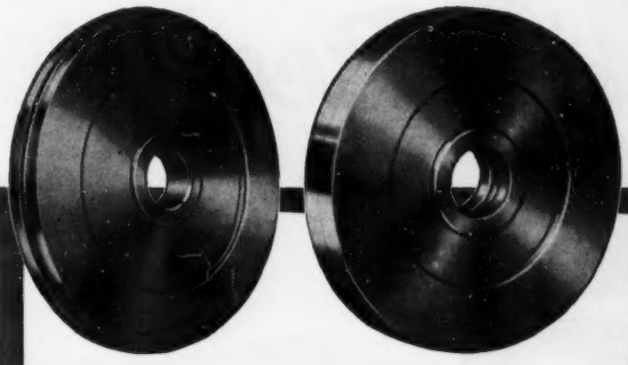
Write for folder 95-E, information and prices:

MAGNA DRIVER CORP.
779 WASHINGTON ST., BUFFALO 3, N.Y.

INDICATE A-11-202-2

MACHINE HIGH SPEED STEEL FORGINGS

Profitably... Automatically



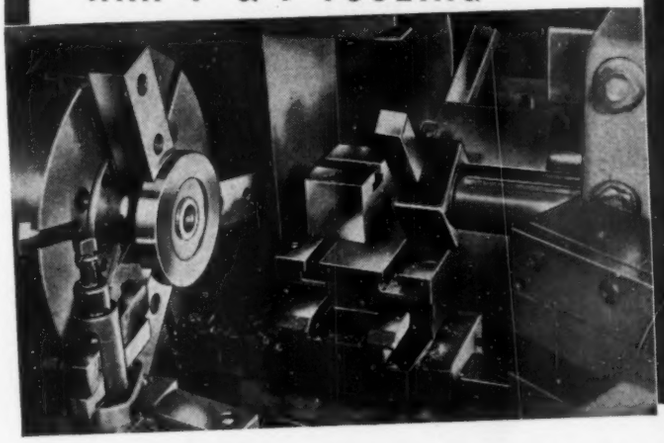
AN ACTUAL CASE HISTORY
involving:

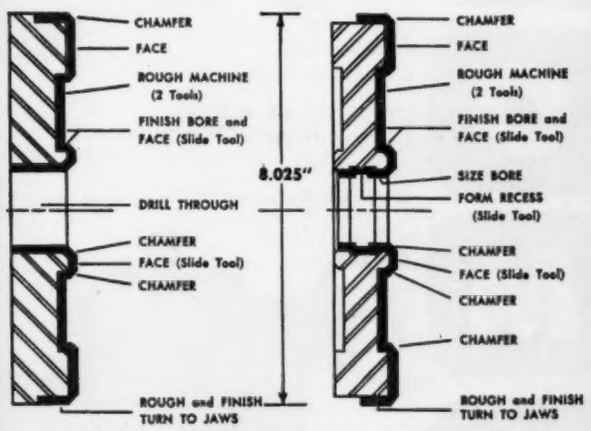
PART: 8" cutter blank, HSS forging

TIME: 9.69 minutes (floor-to-floor) for both operations

MACHINING: 24 separate rough and finish cuts, 11 in first operation, 13 in second operation

DONE ON A:
POTTER & JOHNSTON 4-U
WITH P & J TOOLING



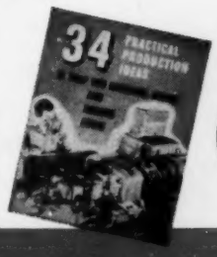


HEAVY LINES INDICATE MACHINED SURFACES

The Potter & Johnston 4-U Automatic Turret Lathe is specifically designed and manufactured to give you the extra speed, power and rigidity needed to machine today's tough alloys faster, more economically. In addition, the 4-U is unusually versatile . . . combined with expert P&J Tooling, it offers new opportunities for increased profits on a wide variety of work types and sizes.

If your present equipment can't deliver performance like the job shown here, you owe it to yourself to learn more about the new 4-U Automatic.

SEND NOW FOR COMPLETE INFORMATION. Write direct or contact your nearest Pratt & Whitney Branch Office; ask for your copy of the 4-U Circular and the "34 Practical Production Ideas" Booklet — to help you increase output and reduce costs.



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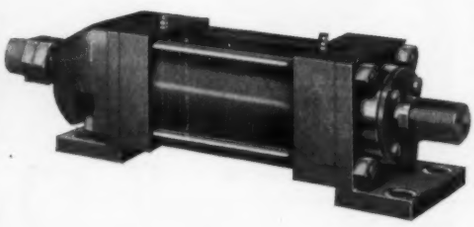

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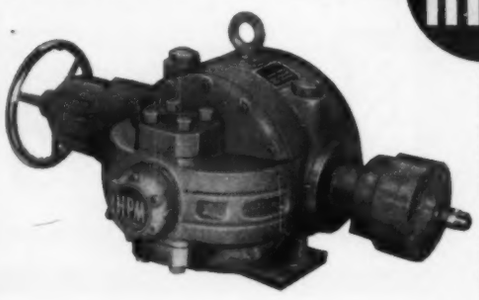

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For over three-quarters of a century H-P-M engineers have designed equipment — and motions — for varied requirements. Now, with a complete line of air and hydraulic components as part of our standard line you are assured of complete responsibility for your automatic systems. The hydraulic cylinders, valves, pumps and power units illustrated are typical of the air and oil hydraulic equipment in the H-P-M line. Call in the H-P-M Field Engineer in your locality when power, or the control of power, is your problem. The experience of the H-P-M organization will be of real assistance.

This 28-page condensed catalog covers the complete H-P-M line of hydraulic components. Write for your copy.

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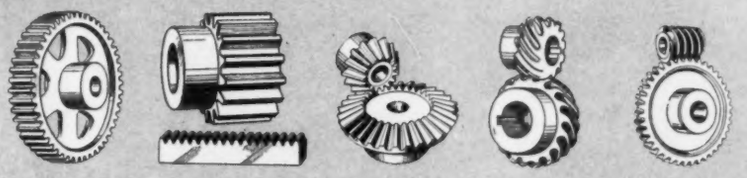
BOSTON Gear®

6562 "off the shelf" STANDARD STOCK TRANSMISSION PRODUCTS



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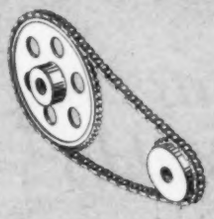

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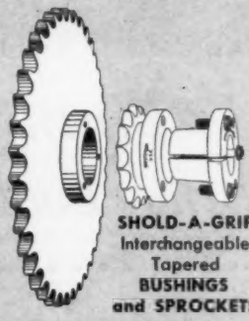
For drives ranging from fractional to 40 hp



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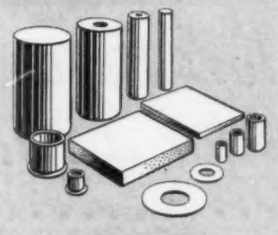
Interchangeable Tapered
BUSHINGS and SPROCKETS
Fit sprockets up to 24" pitch dia. to any shafts ½" to 3" by 16ths



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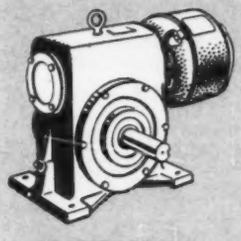
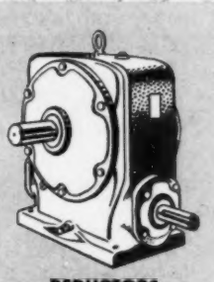
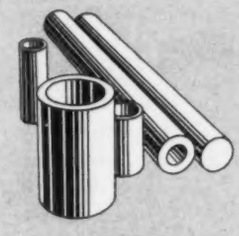


RATIOMOTORS
Motorized Speed Reducers
32 types—1/20 hp to 3 hp



REDUCTORS
Standardized Speed Reducers
.005 hp to 36 hp



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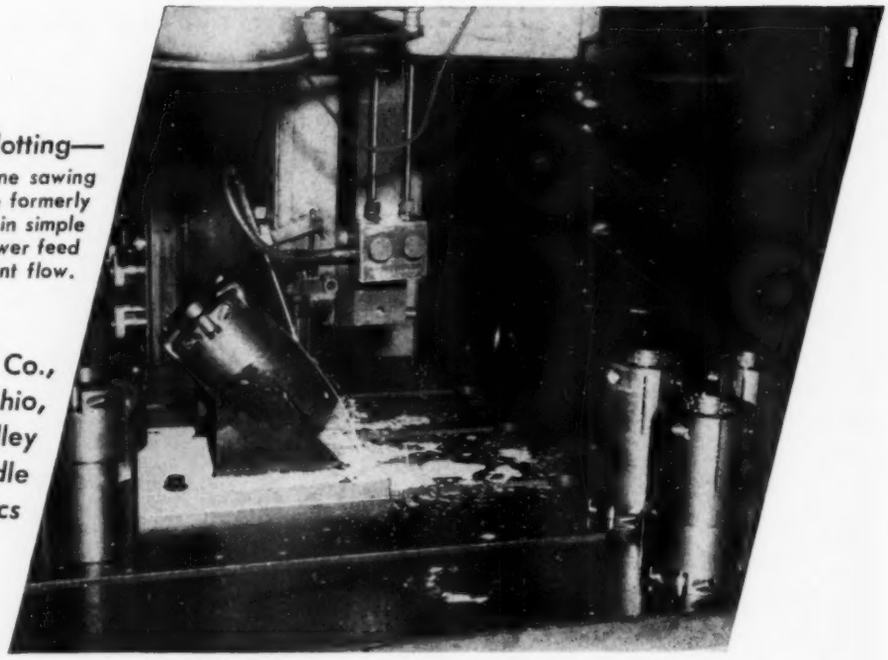


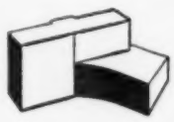
50% Saving on Slotting—
DoALL band machine sawing slots which were formerly milled. Part is held in simple fixture on hydraulic power feed table. Note coolant flow.

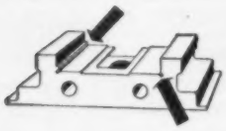
at
National Acme Co., Cleveland, Ohio, builders of Acme-Gridley Multiple and Single Spindle Bar and Chucking Automatics

How Band Machining cuts costs on 600 Parts for a Machine Tool Builder

TYPICAL PRODUCTION BAND MACHINING WORK AT NATIONAL ACME

Cutting Parts from Solid— this assures longer-wearing parts at approximately the same cost as using castings or forgings!





Cutting Grinding Relief

Cutting Contoured Parts

Slotting and Splitting operations

DoALL

At National Acme Co., Cleveland, more than 600 production operations formerly done with milling machines, planers, shapers, torches and lathes are now done at ⅓ to ½ the cost with DoALL band machines.

You can achieve similar savings by utilizing the new concept known as "non-restricted geometry" on production operations such as those illustrated at the left. Here is why:

Faster Cutting — band machining is the fastest method of removing sections of metal.

Less Set-up Time — because of simple fixturing.

Lower Cost Fixtures — often a simple clamp is all that is needed.

Lower Cost Cutting Tool — DoALL saw bands do more work per tool dollar and there are no resharpening costs.

Lower Capital Investment — DoALL power feed band machines cost ½ to ⅕ as much as other production machine tools.

The best way to visualize the concept of production band machining is to see it in action. Ask to have a demonstration truck at your plant. Call your local DoALL Service-Store, or write: ***The DoALL Company, Des Plaines, Illinois.***

New Wall Chart Free: "How Basic Tools Created Civilization". Make request on your company letterhead.

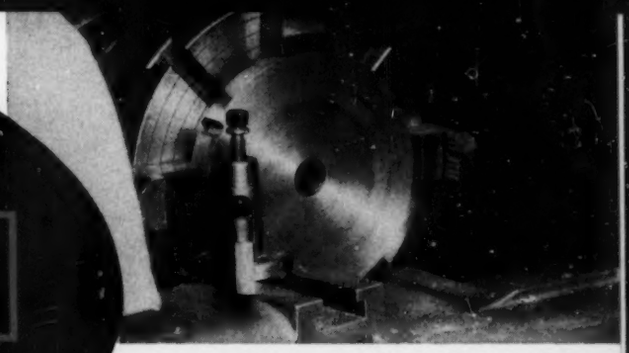
Band Machines . . . Saw Bands . . . Precision Surface Grinders . . . Black Granite Surface Plates . . . Gage Blocks and Other Precision Measuring Instruments . . . Tool Steel . . . Cutting Tools and Supplies

38 DoALL Stores serve industry. See classified directory for one nearest you.

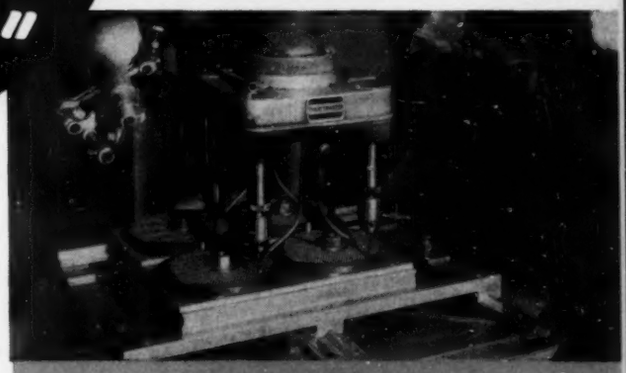
PB-4

for these parts at
Pittsburgh-Erie Saw Corp . . .

"Latrobe's FM Steel a must"



Photographs Courtesy of Pittsburgh-Erie Saw Corp.



Tool life increased 40% when machining Latrobe's "Free-Machining" BR-4 FM at Pittsburgh plant.

Pittsburgh-Erie Saw Corp., Pittsburgh, Pa., reports . . . "Because of the greater ease of machining BR-4 FM, we are reducing our production costs and especially increasing our drill life. Savings in production time combined with greatly increased tool life makes Latrobe's FM steel a must."

Pittsburgh-Erie's experience is another example of the cost-saving benefits derived from using Latrobe's "Free-Machining" FM high alloy tool steels. These FM steels—high carbon-high chromium die steels with sulphide additives evenly distributed as a result of the "Desegatized" process—consistently result in improved machinability, better machined surfaces and production economy through savings in time, labor and tool life.

Results of Specially Conducted Test by Pittsburgh-Erie

Under the same production conditions, the performance of Latrobe's BR-4 FM die steel (with sulphide additives) was compared to that of a regular high carbon-high chromium die steel of similar analysis and hardness.

ROUGHING CUT

	OTHER STEEL	BR-4 FM
Speed	180 RPM	392 RPM
Feed	.014 in.	.024 in.
Depth of Cut	1/16 in.	1/16 in.

FINISHING CUT

Speed	180 RPM	392 RPM
Feed	.014 in.	.010 in.
Depth of Cut	.015 in.	.015 in.

DRILLING TIME

Hole Size 1/8" Plate Thickness 3/4" Hand Feed

BR-4 FM—23 seconds per plate per one hole.
Other Steel—45 seconds per plate per one hole.

Latrobe
STEEL COMPANY
LATROBE, PENNSYLVANIA

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LATROBE, PA.
Please send me data on FM steels.

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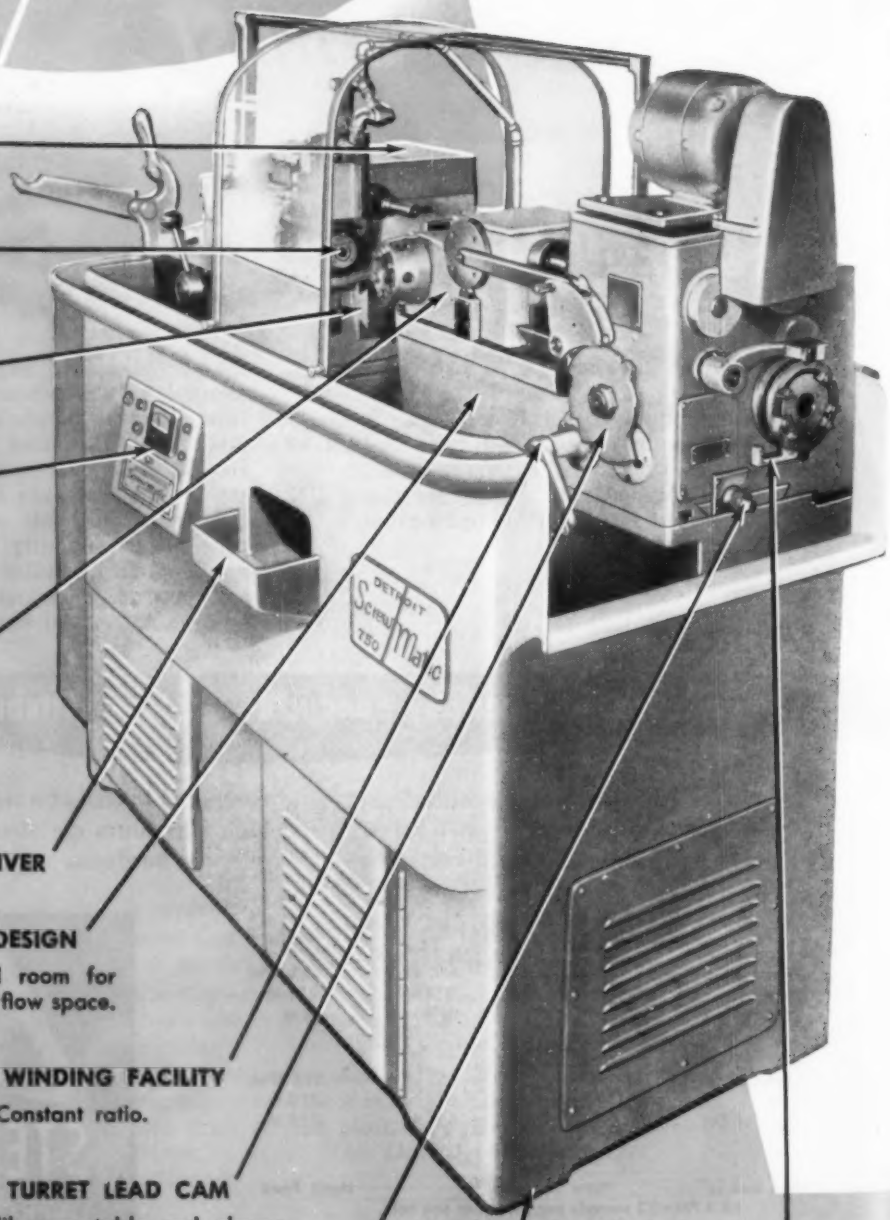
DETROIT Screw Matic 750



ATTACHMENT MOUNTING FACE

WORK SPINDLE

Driven by independently supported V-belt and sheave.

CROSS SLIDES

Direct cam operated.

SPINDLE SPEED

Infinitely variable and reversible. Controlled by simple dial setting. Three preset, independent cutting speeds are conveniently adjustable during cutting.

TURRET SLIDE

Equipped with a three-position crank setting to adjust turret unit away from the spindle.

PARTS RECEIVER

OPEN FRONT DESIGN

Provides unrestricted room for turret tools and chip flow space.

HAND WINDING FACILITY

Constant ratio.

TURRET LEAD CAM

Readily mountable and always visible.

TURRET AND CAMSHAFT UNIT

Self-contained and slideable along machine bed.

MACHINE BASE

Sturdy, one-piece, rigid cabinet. High walls give protection against oil spillage.

OVERLOAD SAFETY DEVICE

Readily accessible position and easy to reset.

WORDS about a *Completely New* Screw Machine

Now, for the first time in 20 years, a new development has been made in screw machine engineering. Three new design principles have been incorporated in the Gear Grinding Machine Company's SCREWMATIC 750 that, in terms of lowered costs and increased production, make it the greatest advancement in screw machine history:

1. Infinite variable spindle speeds instead of gearing.
2. Work spindle drive through V-belts instead of roller chains.
3. Low pressure air cylinders for stock feeding instead of a constant speed backshaft.

These design elements have made possible many outstanding performance features. The SCREWMATIC 750 is now ready to give you—

Higher Work Output Because . . .

An infinitely variable spindle speed drive permits a choice of three different spindle speeds in any cycle of work. Various speeds are obtained by a simple dial setting and are adjustable during actual tool cutting. Reversibility of any of the forward speeds eliminates need of left-hand tools.

Greater Precision . . .

Through arrangement whereby the precision spindle bearings carry cutting tool pressures only. No drive members or clutch bodies are carried by the spindle proper. The precision spindle bearings are anti-friction non-adjustable standard type.

Chatterproof, accurate forming is assured by heavy section cross slides, guided on vertically arranged dovetails. Slide unit is mounted upon deep wall supports. Slides are direct cam actuated. Micrometer adjustment and concealed dead stops are provided.

A six station turret is held in precision needle bearings and locked in hardened taper bushings. This assures accuracy through perfect tool alignment with work spindle. A subbase slide guide permits ready realignment after years of service.

Tool and Cam Layout Simplified . . .

Infinitely variable spindle speeds, together with unrestricted tooling space, simplify tool and cam layout computations. Machine operators will appreciate the fully visible lead cam and setup facilities.

Outstanding Work-length Capacity . . .

A turret slide unit, including the lead cam and drive, mounted longitudinally, slides along the machine base. The unit can be positioned away from the spindle so as to permit work pieces up to 6 inches in length to be machined with turret tools. Even at such lengths, no tool crowding exists—nor are cam "cut downs" required.

This arrangement does not impair economical production of long, short, or medium length parts, for the turret slide and index stroke and speed can readily be changed to suit such parts. All work is produced in the most expedient, economical manner.

Tooling Accessibility . . . Free Chip Flow . . .

The open front design, with its high wall cabinet, permits maximum tool accessibility and tooling space. Chips flow into an ample size, deep chip well. Open ended provision permits chips to be removed from well during machining operations.

Tooling and Attachments . . .

The SCREWMATIC 750 accommodates standard collets, feed fingers, cams and tool holders. In designing the SCREWMATIC 750, special emphasis was placed on incorporating in the machine facilities to adapt readily all commonly used attachments without obstructing the accessibility to tools or the free chip flow.

Simplified Machine Versions to Suit Customer Requirements . . .

The unit design permits the SCREWMATIC 750 to be supplied in simplified forms for long run production of simple parts. The machine can be delivered without such features as variable spindle speeds and spindle reversal. The turret slide can be replaced by a plain tool slide. The spindle is then driven directly from an electric motor over V-belt sheaves.

Capacity . . .

The SCREWMATIC 750 takes bar stock up to .750 inches diameter. For heavy duty machining, standard size collets and feeders are used. The maximum standard spindle speed is 5100 r.p.m.'s. Higher speeds are available on request.

The longest lengths that can be turned with a standard 7-inch diameter cam are 2¼ inches. Longer turning lengths are obtainable with a larger diameter cam.

Cam shaft cycle speeds range from 1.8 to 240 seconds. The SCREWMATIC 750 accommodates standard turret tools with shank diameters of .750 inches.

The SCREWMATIC 750 is manufactered by The Gear Grinding Machine Co.—a company known for its accomplishments in precision, speed, and automation in the field of gear grinding . . . the company that produces the intricate Rzeppa Constant Velocity Universal Joint.

Should you wish detailed information and photographs, use the coupon below.

DETROIT Screw Matic 750

The Gear Grinding Machine Co.

3927 Christopher • Detroit 11, Michigan

We are interested in receiving more information on the new Detroit SCREWMATIC 750.

Company Name_____

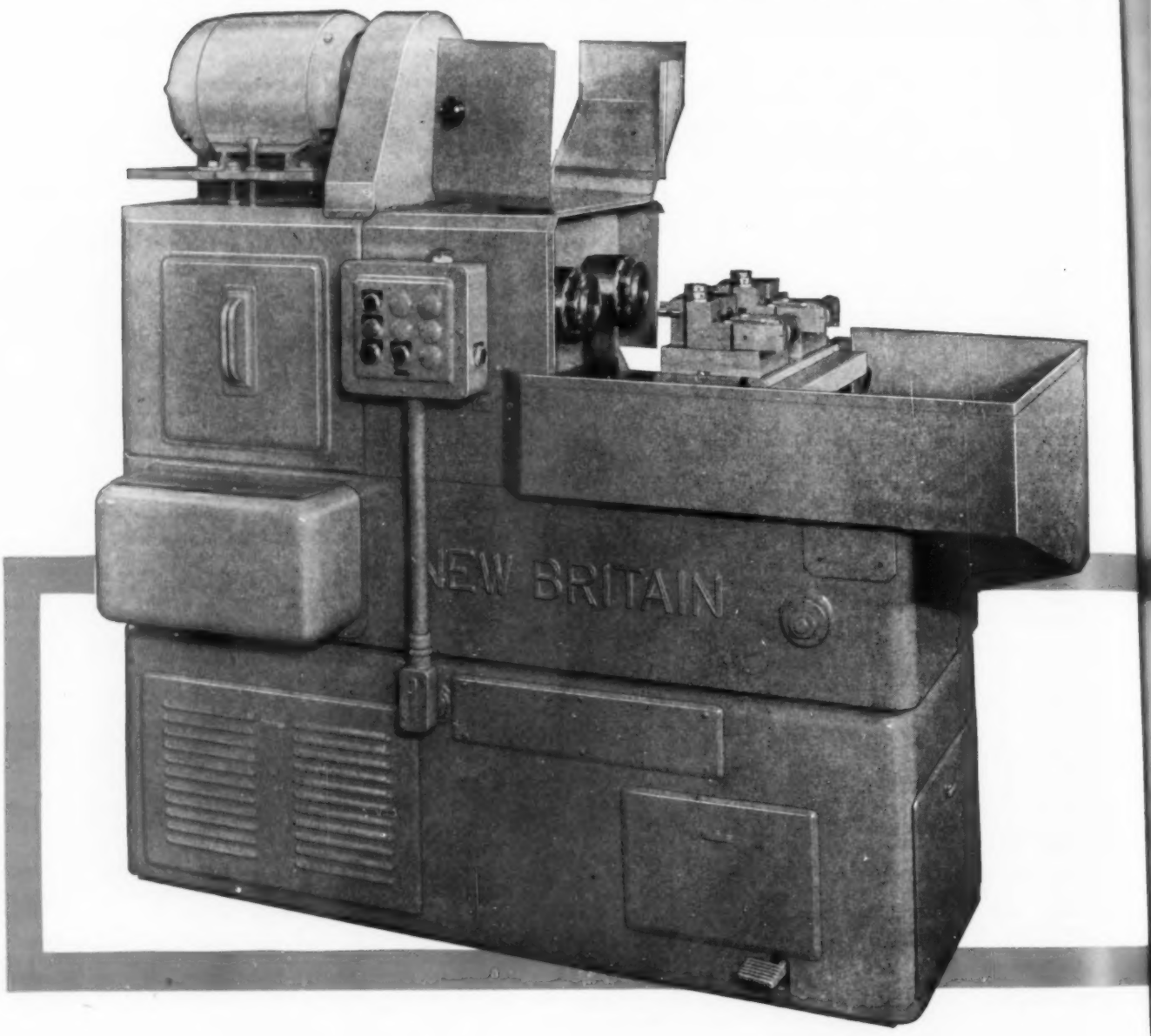
Address_____

City_____ State_____

Send to the Attention of_____

Title_____

The Advantages of PERMANENTLY



New Britain's exclusive application of cam control (illustrated diagrammatically on the opposite page) gives your tool engineer a completely new approach to tooling for complex pieces. Methods impossible on other types of machines can be employed to speed production and eliminate second operations.

A New Britain precision boring machine will not only turn out a wide variety of work at high speeds, but, because of New Britain's exclusive method of cam actuation, will continue producing them with the same repetitive accuracy — piece after piece, week after week.

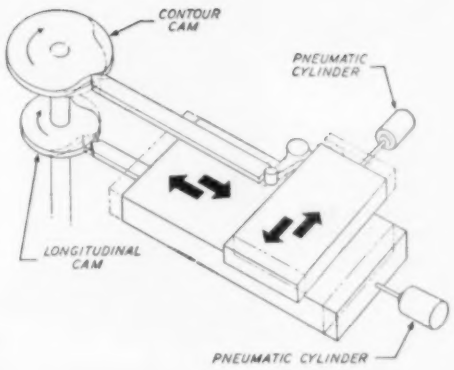
Write for descriptive literature on the New Britain boring machine line, including the details of a variety of specific parts turned out on New Britains.

Cam Actuation....
PRESERVED in New Britain's Precision Boring Machine

Cam shaft, as well as super precision spindles and their motor drive solidly and permanently mounted to frame for continuing accuracy.

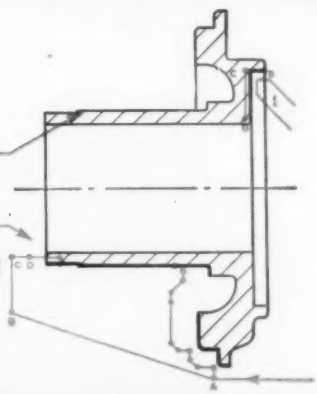
Rugged precision lever transmits cam motion to cross slide.

This exclusive method means simple permanently accurate compound slide motion for an endless variety of single point tool paths.



Expanding arbor chucks piece on I. D.

Back face positively locates against chuck.



With conventional methods, pieces like this present a problem of costly tooling. With New Britain's new approach, tooling this piece is fast, simple and economical with a single chucking and two single point tools.

When you invest in Boring Machines PICK THE MAKE WITH THE EARNED REPUTATION.

THE NEW BRITAIN MACHINE COMPANY

New Britain-Gridley Machine Division, New Britain, Connecticut

Our general catalog is filed in the Sweet's Machine Tool Catalog File.

NEW BRITAIN Automatics NB

Machines for Making Progress

AUTOMATIC BAR and CHUCKING MACHINES • PRECISION BORING MACHINES
LUCAS HORIZONTAL BORING, DRILLING and MILLING MACHINES
NEW BRITAIN +GF+ COPYING LATHES

NOW Clutch Operated Models

extend the applications for

Swanson TURRET INDEXING UNITS

Swanson Series TC Unit shown with optional mounting brackets.

By providing a "packaged" intermittent-motion chassis, Swanson Turret Indexing Units save time and money in designing and building special automatic machines for precision production operations on small and medium parts.

SWANSON series TC indexing turrets differ basically from the accepted series T units only in the solenoid-operated clutch drive provided. They incorporate the same Swanson cross-over cam and locking device to assure harmonious indexing and accurate, positive positioning at all work stations. They are available in a wide range of turret diameters and work stations, with full provision for mounting operational devices of all types.

The new clutch-operated models have been developed to handle applications requiring a high variable of infinite work cycles . . . or where it is desirable to have the operator control the indexing cycles by push-button controls. Limit switches may also be provided to prevent indexing before completion of any operation cycle. Without obligation, Swanson engineers will be glad to suggest applications of these units and accessories to you. In over a third of a century, Swanson-made machines have improved quality and quantity in hundreds of manufacturing operations.

Write for Bulletin TC 4

. . . Some other PRECISION PRODUCTS by SWANSON

POWER-DI Press Units

Turntable Units

Feeding Hoppers

Memory Devices for automatic machines

V-Liner Inspection Units and Concentricity Checking Fixtures

Engineers and Builders of Special precision machinery

SWANSON

TOOL & MACHINE PRODUCTS INC., ERIE, PA.

Quality since 1919

USE READER SERVICE CARD; INDICATE A-11-212-1

For HIGHER ACCURACY IN SPINDLE ALIGNMENT

Types to fit any machine used for tapping or reaming.

On tapping and reaming jobs, aligning the work with the spindle can be done with a higher degree of accuracy if you use a Ziegler Floating Tool Holder in making the set-up.

This is because the Ziegler Holder eliminates the human element which is often responsible for errors when making adjustments to fine tolerances.

With the Ziegler, all you have to do is align the work within 1/32" of center on the radius (1/16" on the diameter) and the holder compensates for the difference, assuring a higher degree of accuracy than is humanly possible without consuming a great deal of time.

Try a Ziegler on your next tapping or reaming set-up and see what a difference it will make in the precision of the work performed.

W. M. ZIEGLER TOOL COMPANY

13574 AUBURN DETROIT 23, MICH.

WRITE FOR CATALOG

Ziegler ROLLER DRIVE FLOATING HOLDER for Taps and Reamers . .

USE READER SERVICE CARD; INDICATE A-11-212-2

A New Concept in Optical Comparator Design...

new WILDER small parts Comparator model C

- Vertical Design
- Erect Image
- Eye Level Screen
- Horizontal Stage

An Entirely New Model Optical Comparator Designed for 100% Production Inspection

ACCURATE - FAST - INEXPENSIVE

Promotes Inspection Economy

If you manufacture mass produced parts that are now being inspected or should be inspected on an Optical Comparator, the new Small Parts Comparator will enable you to inspect them quickly, accurately and economically at a surprisingly low per-piece inspection cost.

Write for Illustrated Folder—Code GINZE

Geo. SCHERR OPTICAL TOOLS, Inc.

200-TE LAFAYETTE STREET • NEW YORK 12, N.Y.

USE READER SERVICE CARD; INDICATE A-11-212-3

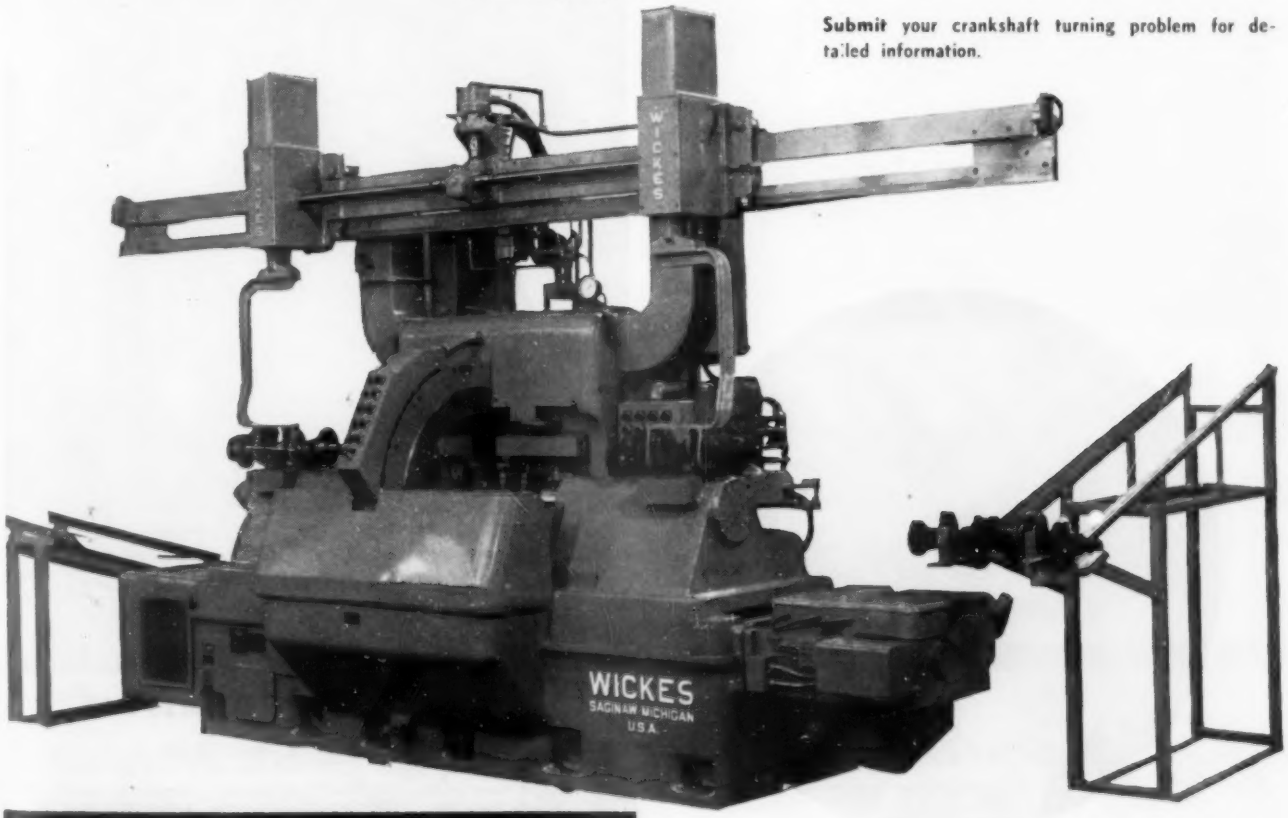
WICKES CENTER DRIVE CRANKSHAFT LATHES

with automatic feeder-unloader now rough and finish machine 20 forged steel V-8 automotive crankshafts an hour on continuous operating cycle

With the new hydraulically operated loader and unloader, Wickes Center Drive Crankshaft Lathes are now machining up to 20 forged steel V-8 crankshafts an hour on a completely automatic work cycle for several of America's largest automobile manufacturers. Here's how the machine operates: Automatic loader picks up milled crankshaft from the loading rack and loads it into center drive position, at the same time it is picking machined crank from the lathe and depositing it on unloading rack. Automatic chuck, synchronized with the loader, closes over the crankshaft as centers move into position. Lathe performs rough and finish cheeking, turning and filleting operations on all main line bearings and finish turns both flange and stub ends. This complete cycle automatically continues to repeat, until transferred to non-repeat by operator.

Wickes manufactures both main line bearing and multiple crank pin turning lathes for all types and sizes of crankshafts. Whether you're machining cast or forged crankshafts or using Tangtung or carbide cutting tools, Wickes has a lathe to fit your production.

Submit your crankshaft turning problem for detailed information.



WICKES

100 YEARS' EXPERIENCE IN SOLVING PRODUCTION PROBLEMS 84

BROTHERS • SAGINAW, MICHIGAN

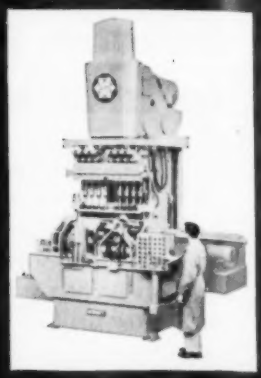
DIVISION OF THE WICKES CORPORATION

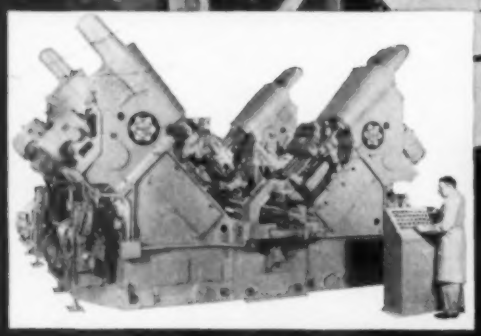
FOR

Production • Accuracy • Economy

V-8 Cylinder Blocks are MICROHONED Automatically on NEW Model 420 Hydrohoners ☆

Specifications of this model are included in our general catalog—obtainable at the offices listed below.





This multiple-spindle, heavy-duty model is designed to fit any type of production line. Examples of its adaptability: above, two four-spindle machines with tip-up fixtures; left, V-type; upper right, eight spindle vertical.

1929 • 1954 — 25TH YEAR OF DEVELOPMENT — PRECISION PRODUCTION THROUGH MICROHONING — MICRO MATIC

MICROMATIC HONE CORPORATION

8100 SCHOOLCRAFT AVE., DETROIT 38, MICHIGAN

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REPRESENTATIVES: Allied Northwest Machine Tool Corp., 103 S.W. Front Ave., Portland 4, Oregon • Mason Machine Tool Company, 415 So. Second East, Salt Lake City, Utah • Tidewater Supply Co., Charlotte 4, North Carolina

REPRESENTATIVES IN ALL PRINCIPAL COUNTRIES

SUBSIDIARY:

Micro-Precision Inc., 2205 Lee Street, Evanston, Illinois

Hydraulic Controls • Diesel fuel injection equipment

choose O-M cylinders for improved

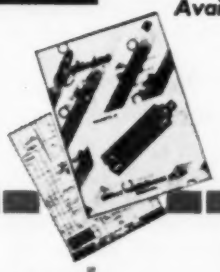
EFFICIENCY

DESIGN

APPEARANCE

Here's the cylinder made to order to meet industry's growing demand for machines that are more functional, cleaner-lined, less cumbersome. You don't sacrifice bore size in tight quarters when you specify O-M Air or Hydraulic Cylinders. *SPECIAL INTERLOCKING MECHANISM* does away with bulky tie rods, end caps . . . *saves up to ⅓ installation space!* Interlocking feature also provides perfect alignment, lower coefficient of friction which makes possible smoother performance at low or high speeds regardless of length of stroke. Easily removed, inspected, repaired. Completely interchangeable parts.

fit where others won't!



Available in full range of sizes (1½" to 8" bores) with standard, 2 to 1 or oversize rods. All steel construction with bearing bronze. *14-day delivery on most sizes.*

ORTMAN-MILLER MACHINE COMPANY
13 143rd Street, Hammond, Indiana

Mail coupon now!

for FREE catalog and complete set of ½ and ¼-scale templates showing all cylinders and mounting brackets.

☐ Have representative call ☐ Send latest catalog
☐ Send ¼-scale templates ☐ Send ½-scale templates

Name _____ Position _____
Company _____
Address _____
City _____ Zone _____ State _____

Here's why users are re-ordering Norton discs

Job reports show how disc grinding can be made more profitable with the money-saving "TOUCH of GOLD"

Typical reports from customers who re-ordered Norton discs

From Tennessee

Job: Wet grinding ends of universal joint spiders, case hardened steel, 58 to 62 R.C., ½" diameter. Rotary work carrier.

Report: Pair of Norton 22" x 2" x 14" discs produced 366,975 pieces without burn — outlasted and outperformed all other discs.

From Indiana

Job: Double disc dry grinding, 6" to 8" diameter cast iron rings, ¾" face, removing .015", .010" and .005" in 3 successive passes.

Report: Norton 30" x 2" x 3½" discs averaged 21,500 pieces, a new high for this job.

From Illinois

Job: Double disc wet grinding hot wound heavy duty coil springs. Reciprocating work holder.

Report: Norton 30" x 3" x 6" discs rated high above competition for output and grinding quality.

From Missouri

Job: Double disc wet grinding cast iron piston rings, roughing operation.

Report: Initial shipment of Norton 30" x 1" x 1" discs produced over 6,000,000 rings — 100% more than competitive discs, with 50% less dressing. Results duplicated in subsequent shipments, establishing Norton discs as best ever received.

From Kentucky

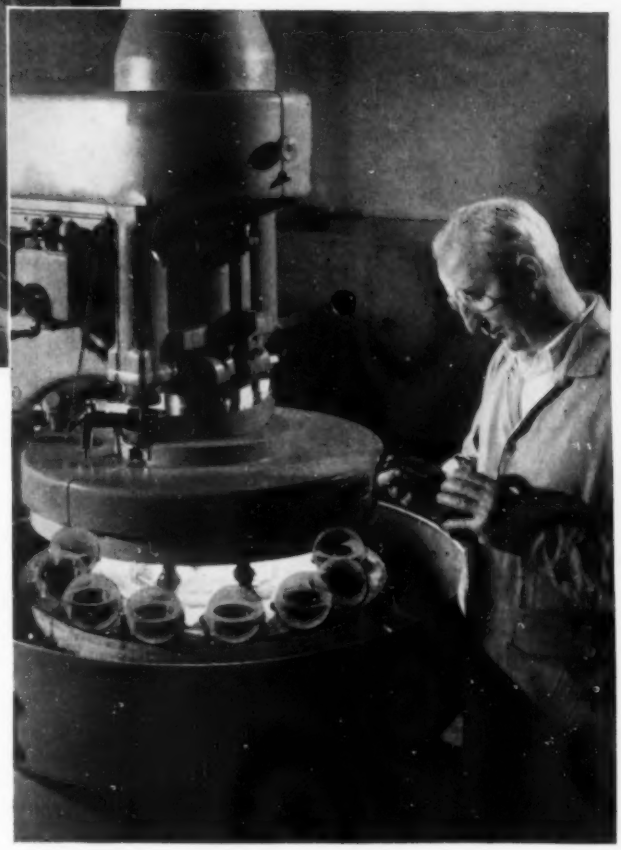
Job: Single disc grinding high-carbon steel inserts, dry grinding ½" x ¼" area.

Report: Norton 18" x 2" x 5" discs outproduced best previous discs 2 to 1.

From Michigan

Job: Tool room surfacing steel jigs and fixtures, single disc, wet grinding small to large areas, up to .125" stock removal.

Report: Norton 18" x 4" x 14" discs gave 20% longer service life than competitive discs.



Once Norton discs are tried, you can give odds that they'll be re-ordered. Freer, cooler cutting action, longer service life and increased production per disc are very good reasons why. Let's look at some other reasons:

- Norton discs are engineered to give best results over the entire range of disc grinding — from snagging to lapping, single or double surfacing, wet or dry grinding, large or small areas — on every type of disc grinder.
- They are made of the famous ALUNDUM* and CRYSTOLON* abrasives, in five bonds and all types of mountings.
- Their wide variety covers all materials ground by this method — metallic or non-metallic, ferrous or non-ferrous, alloys or machine steels, hard or soft.
- They are precision-built for uniform grinding action throughout their service life — from disc to disc and lot to lot.

Norton will engineer discs to your exact specifications — and duplicate these exactly on each re-order. It's the simple, logical way to put the profit-boosting "Touch of Gold" into your own disc grinding operations.

Your Norton Distributor

can give you valuable help in selecting the right discs for your jobs. Ask him for the new booklet "Disc Grinding." Or write to NORTON COMPANY, Worcester 6, Mass. Distributors in all principal cities, listed under "Grinding Wheels" in your classified phone directory. *Export:* Norton Behr-Manning Overseas Incorporated, Worcester 6, Massachusetts. W-1587

Making better products . . .
to make other products better

NORTON

and its BEHR-MANNING *division*

NORTON: Abrasives • Grinding Wheels • Grinding Machines • Refractories
BEHR-MANNING: Coated Abrasives • Sharpening Stones • Pressure Sensitive Tapes

*Trade-Marks Reg. U. S. Pat. Off. and Foreign Countries

JIG GRINDING ACCURACY *guaranteed**

INFINITE CONTROLLED SPEEDS 30,000 TO 65,000 R. P. M.

Easily connect jig grinder to jig borer or mill

Then you can finish grind in hardened steel to "tenths" . . . jig grind dowel holes square with a ground base . . . move location of holes in hardened steel blocks . . . jig grind interchangeable holes in hardened sections . . . grind small holes with diamond impregnated mandrels . . . grind contours and relief with tungsten carbide burrs . . . grind radii in die sections . . . eliminate jig bushings in tools where close spacing is essential.

Other infinitely controlled air driven spindle applications

Place spindle on most any machine. Use it for finishing contours on hardened steel working surfaces . . . burring or milling die castings . . . routing wood contours . . . carbide milling or finishing slots . . . finishing holes in hardened steel to "tenths" . . . grinding with diamond wheels, carbide burrs, or diamond impregnated mandrels.

Advantages—10 micro finishes using carbide mills . . . 6 micro finishes using mounted points, operates at any angle . . . air driven, air cooled, overheating prevented . . . speed controlled at optimum point . . . 3⅛" long motor uses little working space . . . By controlling speed at any point you abolish need for many constant speed spindles.

For immediate quotation please state machine tool application. Get this manual of photos showing operations Vulcanaire performs.

*Dependably accurate to "tenths"

Vulcanaire

It's built by toolmakers for toolmakers

MAJOR VULCAN SERVICES

Engineering, Processing, Designing and Building, Special Tools . . . Dies . . . Special Machines . . . including the *Vulcan Hydraulics that Form, Pierce, Assemble and Size.*

VULCAN TOOL CO.

7300 LORAIN AVENUE • DAYTON 10, OHIO

USE READER SERVICE CARD; INDICATE A-11-218-1

More and More Industries are Cutting Costs and Speeding Up Production *with...*

ROUSSELLE Presses!

It took some concentrated planning, stressing ruggedness and simplicity, along with accurate machining and "close-tolerance" assembly, to bring out these fast, rigid, high output units — THAT COST SO LITTLE — DO SO MUCH — REQUIRE SO LITTLE MAINTENANCE.

In addition to metal forming, bending, shearing, notching, and piercing, they are also adaptable to cutting and punching paper, forming and cutting fibre, plastics, etc.

Often considerable savings are possible if you let our engineering staff assist you. There is no obligation. Simply explain the problem and send sample or drawing of work.

Rousselle Presses are Sold Exclusively through Leading Machinery Dealers and are manufactured by

SERVICE MACHINE CO.

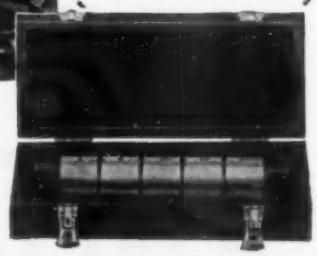
7627-33 S. Ashland Ave. • Chicago 20, Illinois

USE READER SERVICE CARD; INDICATE A-11-218-2

Check Surface Roughness Waviness and Lay INSTANTLY

. . . Right At The Machine

With ACME'S ROUGHNESS COMPARISON SPECIMENS



Consists of various surface specimens, *individually finished* to definite micro-inch readings, grouped together in one handy comparison bar. Merely hold bar opposite work for fast, visual comparison check of surface roughness, waviness and lay.

Available in groups of 3, 5 and 8 specimens. Low cost. Write for details, now!

Mfr's. of Drill Jig & Fixture Bushings

ACME INDUSTRIAL COMPANY

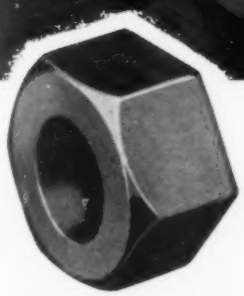
208 N. Laflin St. Chicago 7, Illinois

THE SERVICE SHOP TO INDUSTRY FOR OVER A QUARTER CENTURY

USE READER SERVICE CARD; INDICATE A-11-218-3

4200 Nut Blanks Per Hour

Feed rolls push barstock through TOCCO Induction Coils to heat stock to 2350°F for forging.



with TOCCO* Induction Heating

FASTER PRODUCTION—4200 nut blanks per hour—twice the output of a conventional hot punching machine—that's the result of Lamson & Sessions Company's new automatic production set up with TOCCO Induction Heating.

OTHER ADVANTAGES—TOCCO delivers exact temperatures (2350°F, plus or minus 25°) and delivers them so fast that scale has little time to form. Scale loss has been reduced to only about 1% for hot-rolled stock. TOCCO is clean and cool, fits right into the production line—no hauling to and from the heat-treat department—no unpleasant radiant heat to annoy workers.

HERE'S HOW IT WORKS—Steel bars up to 1½" diameter are fed through TOCCO Induction Coils. The first two coils, operating off a 300 kw, three kc TOCCO motor-generator set, preheat the rod. The third coil which operates from a TOCCO 250 kw 10 kc generator then boosts the rod to forging temperature. The hot rod then is fed to the special hot nut former (designed and built by NATIONAL MACHINERY CO.) which shears the rod to suitable lengths, forms the part and spits out the nut blank—ready for tapping.

In your search to find sound methods of increasing production, improving products and lowering costs, don't overlook TOCCO Induction Heating. If your products require heat treating, soldering, brazing or forging, it will pay you to investigate TOCCO for better, faster ways of producing them at lower unit costs.

THE OHIO CRANKSHAFT COMPANY

TOCCO

*Trade Mark Reg. U. S. Pat. Off.

Mail Coupon Today

FREE BULLETIN

THE OHIO CRANKSHAFT CO.
Dept. G-11, Cleveland 1, Ohio
Please send copy of "Typical Results of TOCCO Induction Heating for Forging."

Name_____
Position_____
Company_____
Address_____
City_____ Zone____ State_____

High Precision, Reliability, Top Performance

SCHAERER

MODEL UN-450

HEAVY DUTY LATHE

SCHAERER MODEL UN-450
HEAVY DUTY
COPYING LATHES.

Twin cross slides. Copies from cylindrical or flat template either longitudinally or cross. Twin slides permits rough turning and finish turning in the same operation in many instances. Swings 17-3/4" over bed, 9" over carriage, 20-5/64" over gap. Center distance 60". Spindle speeds 31.5 to 1400 R.P.M. Hydraulic copying attachment can be removed to permit use as a regular twin slide lathe when necessary. 10 H.P. motor drive to spindle. Separate motors for coolant and hydraulic pump. A production lathe built to tool room standards.

OUTSTANDING FEATURES

Copies simultaneously in 2 directions; 49 longitudinal and cross feeds; All gears in headstock hardened and ground; Automatic carriage release when overloaded; Separate oiling systems for front and rear end bearings; Ball stop catch on cross slide guarantees accurate depth adjustment for thread cutting; Adjustable carriage stop for longitudinal turning.

- *Guaranteed Service by Trained Staff*
- *Engineering Staff will make recommendations based on your requirements*
- *Spare Parts in Stock*
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- *Early Deliveries — Some from Stock*
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Many More Machines for Every Operation

Write for free illustrated brochure 100, or state your specific requirements.

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M. B. I. EXPORT & IMPORT LTD.

A Division of Machiney Builders Inc.

Over twenty years experience in designing and building machinery

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MBI

TAPS *by* CARD

The best way to gauge the value of a tap is to try it. You'll find Card taps live up to their reputation every time.

The CARD Quality

Completely stocked offices at Atlanta, Chicago, Detroit, Fort Worth, Los Angeles, New York, San Francisco and Seattle

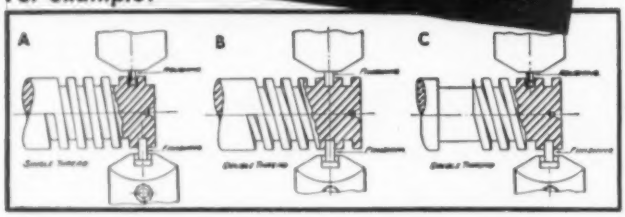
See your local Card distributor for prompt deliveries and helpful service

S. W. CARD MANUFACTURING CO., MANSFIELD, MASS. • DIVISION OF UNION TWIST DRILL CO. **TAPS • DIES • SCREW PLATES**

How Do Coulter Automatic Threading Lathes SAVE TIME, MONEY, LABOR?

Because they are designed to permit over 25 alternatives for setting up the threading tool to meet specific applications.

For example:



Ⓐ Roughing and finishing Single Square Threads.
Ⓑ Finishing Double Square Threads.
Ⓒ Roughing and finishing Double Square Threads.

The "L1" is the most versatile of any threading Lathe, for the production of Square, Standard and 29° threads, internal or external . . . and it does it faster, better — AUTOMATICALLY!

Without obligation, consult our engineers with your specific threading problem. Catalog and machine specifications available upon request.

James Coulter Machine Co.

645 Railroad Ave. Bridgeport 5, Conn.

Machine Tool BUILDERS Since 1896

USE READER SERVICE CARD; INDICATE A-11-222-1

ILLUSTRATED IS A WESTERN No. 3-12 UPRIGHT DRILL EQUIPPED WITH A GUSHER COOLANT PUMP. MODEL 3-P3.

You'll Get

BETTER RESULTS

From Your **RUTHMAN GUSHER COOLANT PUMP**

because **RUTHMAN** makes a better pump

Don't take our word for it. We'll be glad to show you our long list of satisfied users, machine tool manufacturers that have used Gusher Coolant Pumps as standard equipment on their machines for *ten, twenty, thirty years.* Honestly, it reads like a blue book of the leading machine tool manufacturers. *Follow the leaders.* Specify Ruthman Gusher Coolant Pumps for all your metal cutting machinery.

THE RUTHMAN MACHINERY CO.

1810 READING ROAD CINCINNATI, OHIO

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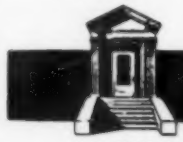
PRECISION CIRCULAR CUTTERS

MEYCO carbide tipped and solid carbide cutters have earned an enviable reputation in plants where long tool life and precision workmanship is a MUST.

These cutters can be furnished in various diameters and thicknesses to meet the requirements of individual applications.

Saws and cutters, both carbide tipped and solid carbide, will aid production and precision in your slotting, venting, slitting and grooving operations . . . and they will be manufactured to your specifications. Please furnish complete specs and quantities desired when requesting prices and indicate material to be cut. MEYCO experience in the manufacture of precision tools, since 1888, is at your disposal.



W. F. MEYERS CO., INC., BEDFORD, INDIANA

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ANY WAY YOU LOOK AT IT...

from PRECISION GRINDING to ROUGH SNAGGING

SIMONDS ABRASIVE CO.

Grinding Wheels

give superior results

Accuracy of finish—or top tonnage ground! Just name your grinding need. There's a Simonds Wheel exactly right for the job. Right in grain and grade. Correct in shape and size. Dependable in action and economical in wheel wear. Write for free data book and name of your Simonds distributor.

SIMONDS ABRASIVE COMPANY

PHILADELPHIA 37, PA.

BRANCH WAREHOUSES: Boston, Detroit, Chicago, Portland, San Francisco

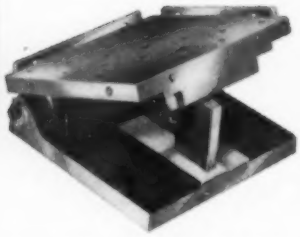
DISTRIBUTORS IN PRINCIPAL CITIES

Division of Simonds Saw and Steel Co., Fitchburg, Mass. OTHER SIMONDS COMPANIES: Simonds Steel Mills, Lockport, N. Y., Simonds Canada Saw Co., Ltd., Montreal, Quebec and Simonds Canada Abrasive Co., Ltd., Arvida, Quebec

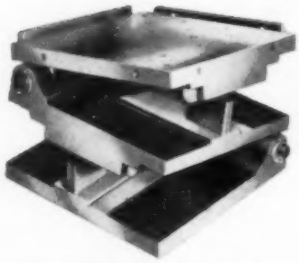
Some Simple Ways To Set An Angle

with Taft-Peirce Sine Checking Equipment

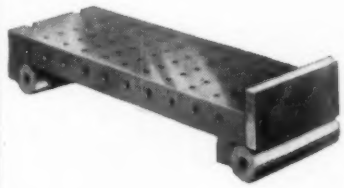
For Setting Up



T-P SIMPLE SINE ANGLE PLATE
is a convenient new device for setting up any angle from 0 to 90 degrees. A .1000″ step on base provides for obtaining angles requiring a setting smaller than .1000″. For grinding, light drilling, inspection operations.

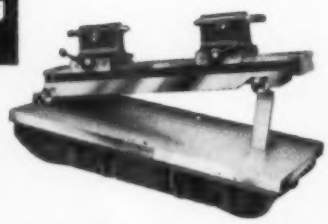


T-P COMPOUND SINE ANGLE PLATE
permits angular setup in two planes simultaneously. Just clamp part to tapped holes. Set angles with gage blocks. Tighten lockscrews to secure plates. Has same 6″ x 6″ base as Simple Sine Angle Plate.



T-P SINE BLOCKS
combine the features of a sine bar with a right angle iron. Tapped holes on all working surfaces facilitate clamping. Top surface parallel within .0001″ to center line of sine plugs. 6″ and 10″ lengths standard. Specials to order.

For Checking

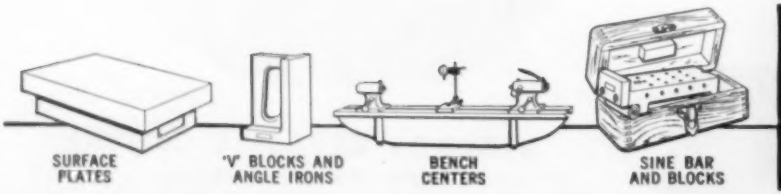


T-P SINE BLOCK TAPER TESTING FIXTURE
combines a 20″ sine bar with pair of adjustable precision centers. Base is 14″ x 24″ precision surface plate fitted with adjustable end stop. Can check tapers up to 15″ long and 6″ in diameter.

T-P SINE BAR FIXTURE
puts sine bar on pivot. Pivot end may be raised or lowered independently of angle setting. Knurled-headed screws on pivot arm provide fine, accurate angular adjustment of bar. Available with 5″ or 10″ sine bar.

T-P SINE BARS
are used for measuring angles precisely or for locating work to a given angle within very close limits. Center line of sine buttons held accurately parallel to upper and lower face of bar. 3″, 5″, 10″, and 20″ standard lengths.

For more complete details on these and many other Taft-Peirce products, send for your copy of the Taft-Peirce Handbook.



T-P means Top Precision

T P

THE TAFT-PEIRCE MANUFACTURING COMPANY, WOONSOCKET, RHODE ISLAND

Just off the press—

THE HOW AND WHY OF BETTER QUENCHING WITH GULF SUPER QUENCH

GULF SERVES INDUSTRY

GULF OIL CORPORATION · GULF REFINING COMPANY

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Gentlemen:

Please send me, without obligation, a copy of your new 24-page brochure dealing with the application and advantages of Gulf Super-Quench.

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Bay State Taps produce threads of the utmost precision with a maximum of productivity. This dual quality of Bay State Taps . . . precision performance . . . is readily available from nearby shelves of industrial supply distributors.

BAY STATE TAPS

BAY STATE TAP & DIE COMPANY MANSFIELD, MASS.

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ORDER BUSHINGS The EASY WAY!

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COLONIAL DRILL JIG BUSHINGS

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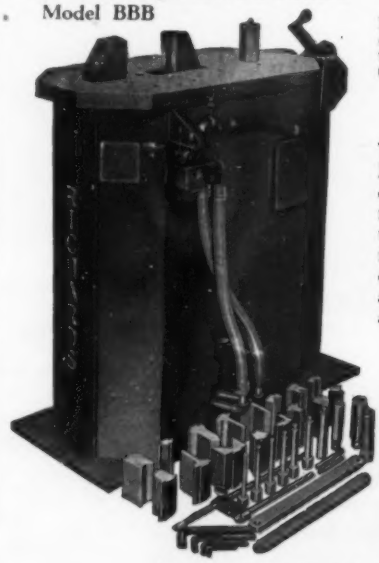
Multiform

BIG BROTHER BENDER

Produces Without Special Tooling—Saves Die Costs Saves on Expensive Presses

Model BBB



Illustrated above are a few of the many forms that can be produced efficiently on the Multiform Bender, using the standard tooling.

The heavy duty Big Brother Bender is designed for fabricating bus bars, brackets, fixtures, etc., without special tooling. Air controlled with finger tip response. Comes complete with dies, mandrels and wrenches—punching and blanking dies extra. Will punch holes up to 1" and form material up to ⅛" thick by 4" wide. We also build smaller hand or air operated models for forming up to 1/16"x1½" material.

Send for illustrated folder TE-5

903 North Pitcher St.
Kalamazoo, Michigan

J. A. RICHARDS CO.

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Miller

FLUID PRESSURE BOOSTERS

- Save space, weight and investment cost by replacing pump installations in many applications
- Less costly to install, operate and maintain
- **Hold pressure indefinitely** without the motion and heat generation of ordinary pump circuits
- Provide—at point of cylinder thrust—more efficient power with less weight in less space than direct driven air cylinders
- Save up to 95% of air consumed by direct driven air cylinders
- Operate at speeds of 30 to 450 strokes per minute

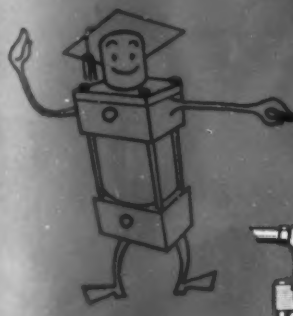
NOTE: In addition to its most complete line of "Custom-Built" Boosters available on normal delivery, Miller offers 5" bore 2½ to 1 ratio, boosters for immediate delivery in either 6" or 12" stroke. Write for data and prices.

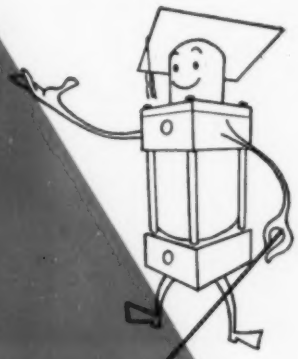
BOOST 80 PSI AIR

Input Range: 40 to 3000 psi Air or Fluid

TO 2000 PSI HYDRAULIC PRESSURE

Output Range: 200 to 10,000 psi Fluid





FULL DETAILS IN MILLER BULLETIN B-200 SENT FREE ON REQUEST

Other Miller products include: Air cylinders, 1½" to 20" Bores, 200 PSI operation; low pressure hydraulic cylinders, 1½" to 6" bores for 500 PSI operation, 8" to 14" bores for 250 PSI; high pressure hydraulic cylinders, 1½" to 12" bores, 2000-3000 PSI operation. All mounting styles available.

ESPECIALLY RECOMMENDED FOR

- **WELDING**
- **PUNCHING**
- **SHEARING**
- **CLAMPING**
- **RIVETING**
- **CRIMPING**
- **PRESSING**

and similar applications

SALES AND SERVICE FROM COAST TO COAST

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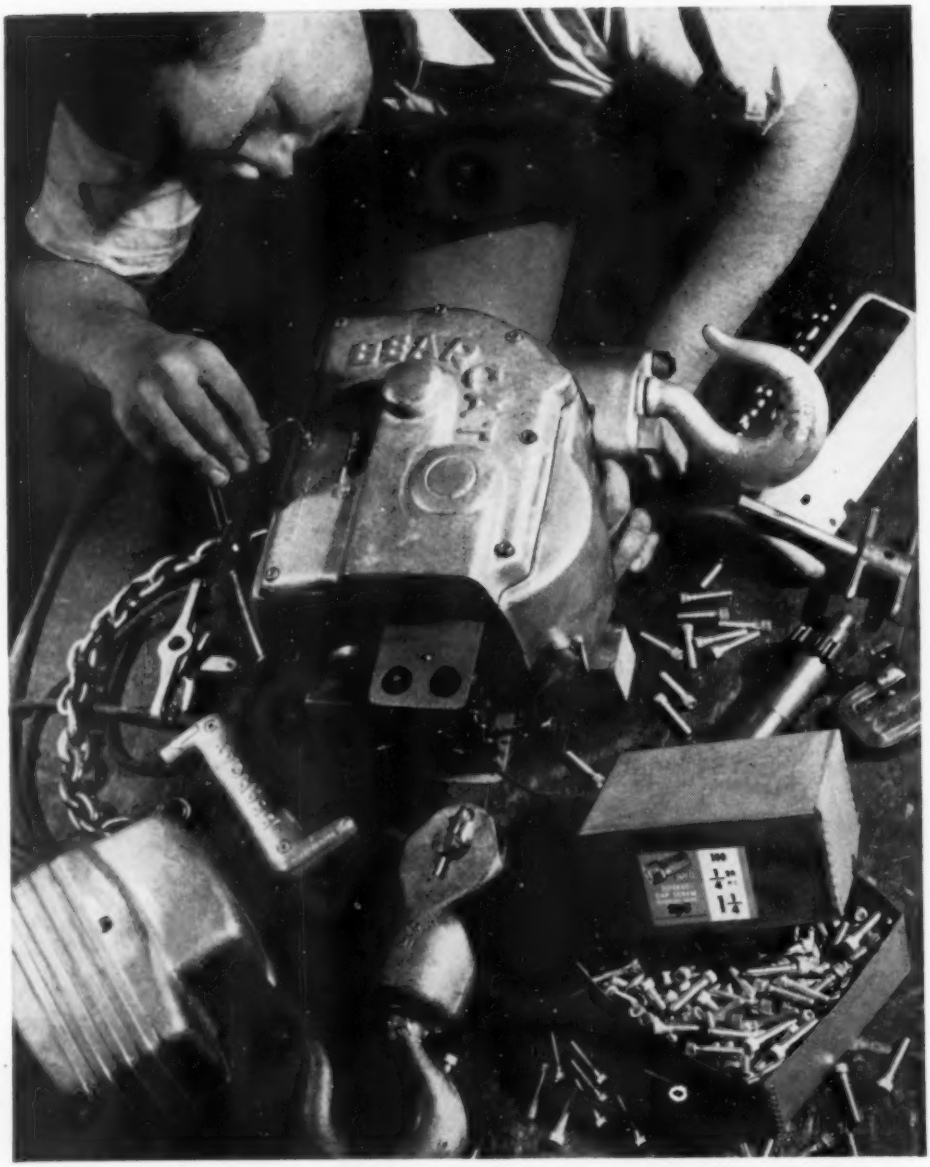
Miller

MILLER FLUID POWER CO.

(Formerly MILLER MOTOR COMPANY)

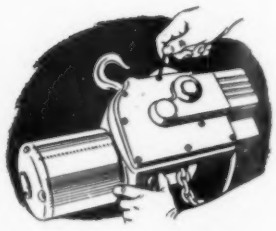
2010 N. HAWTHORNE AVE. • MELROSE PARK, IL

AIR & HYDRAULIC CYLINDERS • BOOSTERS • ACCUMULATORS
COUNTERBALANCE CYLINDERS



23 UNBRAKO Socket Head Cap Screws are used to assemble this lightweight, high efficiency electric hoist. They were selected for their uniform accuracy and high tensile strength.

The knurling on the head of UNBRAKO Socket Head Cap Screws permits faster assembly, because of the positive slip-proof grip.



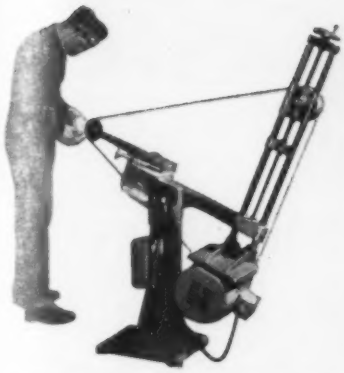
The uniform depth and size of the hex socket assure strength and maximum torque in wrenching—extremely important in the cap screws used to fasten assemblies like this.

UNBRAKOS—made of heat treated alloy steel—have fully formed threads, Class 3 fit; controlled fillet and continuous grain flow for strength. In standard sizes from # 4 to 1".

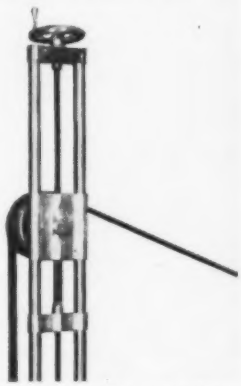
Save time and money by using UNBRAKO Standards...stocked by your distributor

You'll have less money tied up in inventory, you'll need less space for storage, you'll get personalized service and faster deliveries. And you'll be buying the finest socket screw products that modern machines, complete facilities and quality control can produce. Write for UNBRAKO Standards, a complete listing of socket screw products made by the world's largest producer. STANDARD PRESSED STEEL CO., Jenkintown 37, Pa.

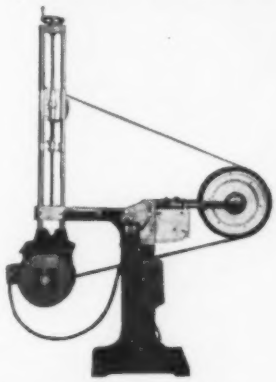
UNBRAKO® SOCKET SCREW DIVISION SPS JENKINTOWN PENNSYLVANIA



With all equipment balanced on single base, operator can stand or sit.



No problem tracking, and new spring device maintains constant tension.



New NEMA style GE Motor takes less space and weighs less than older types.

Uses contact wheels 3" to 18" dia., and standard BEHR-MANNING BELTS.

Manufactured and sold by Stephen Bader & Co., Valley Falls, N. Y.

SAVE SPACE and MONEY with NEW BELT POLISHER

New BADER "Space Saver," shown here, is the latest development in modern belt polishing machines. Contact wheel, idler, and motor are all mounted on a single pivotal base.

The BADER "Space Saver" occupies a minimum amount of valuable floor space. Installation is simple — lag the machine to the floor, make electrical connection, and start production.

New NEMA style motor takes 1/3 less space and weighs 1/3 less than conventional motors. And for your special interest, this BADER does a terrific polishing job with BEHR-MANNING® Belts.

See and try the new BADER "Space Saver" at your nearest BEHR-MANNING Demonstration Room. Contact our nearest Branch, or write Behr-Manning, Troy, N. Y., Dept. TE-11.

In Canada: Behr-Manning (Canada) Ltd., Brantford.

For Export: Norton Behr-Manning Overseas Inc., New Rochelle, N. Y., U. S. A.

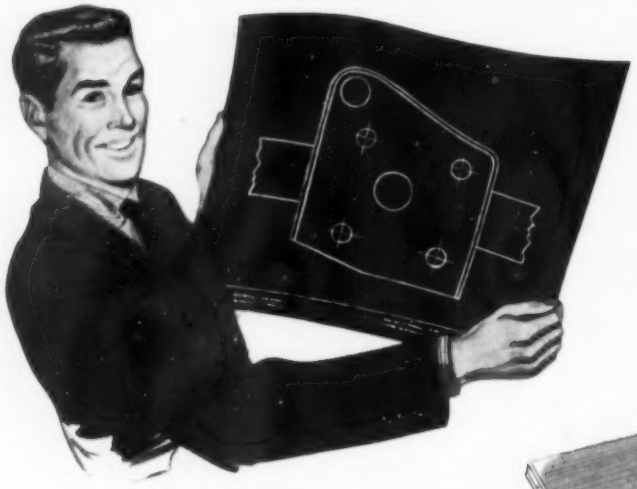
BEHR-MANNING® CORPORATION
division of NORTON Company

▲ COATED ABRASIVES
▲ SHARPENING STONES
▲ PRESSURE-SENSITIVE TAPES

G-5

For the newest in coated abrasives . . . watch BEHR-MANNING!

Keller Multiple Nut Setters

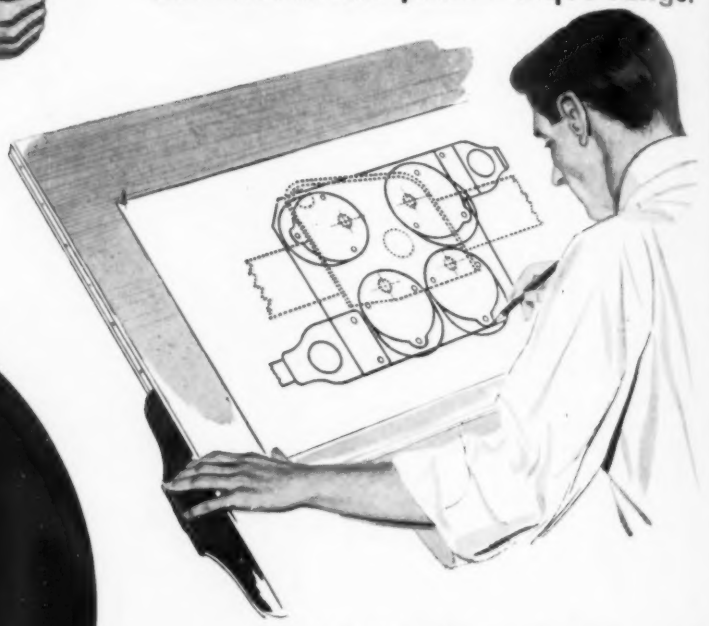


achieve

ACCURATE TORQUE CONTROL and FAST RUN-DOWN

on multiple nut setting operations in the 4 to 140 foot-pound torque range.

From the bolt pattern on your own blueprint



. . . a tool design that meets your needs

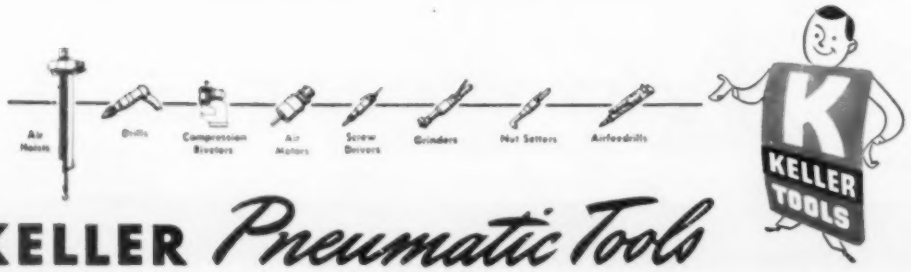
. . . and a complete Multiple Nut Setter built up with standard unit assemblies

Do you have a nut setting problem involving a reduction in time or the maintenance of accurate torque control in setting two or more nuts? Then let our field engineer show you how Keller Multiple Nut Setters can solve this type of problem.

On your own blueprint of the job, he will lay out the complete tool—showing size and location of motor units and handles, and an outline of the mounting plate.

From this layout, Keller builds up the complete Multiple Nut Setter from standard units (only the mounting plate is special). You have a tool engineered to your specific job—with economies gained from standard unit construction.

For catalog information, ask for Bulletin No. 12.

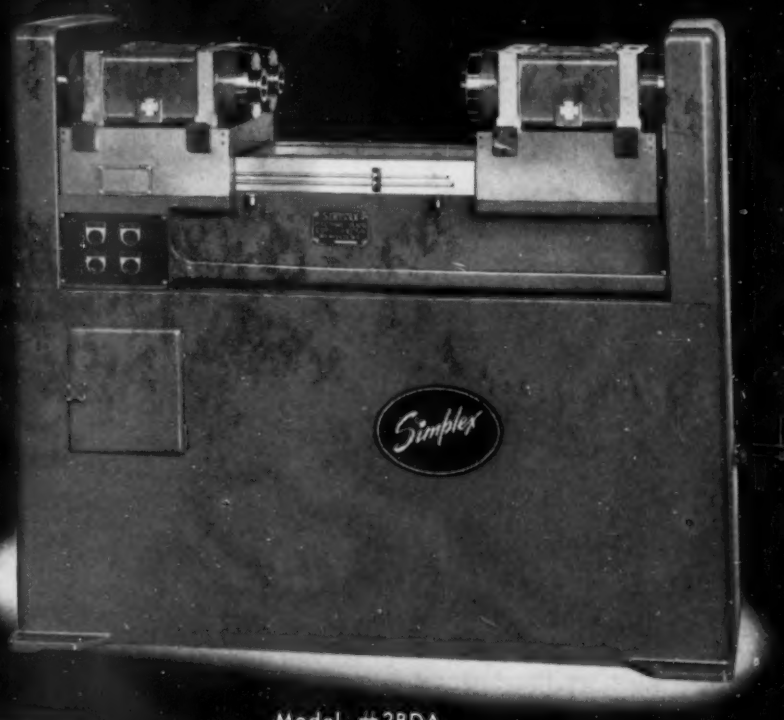


KELLER *Pneumatic Tools*

KELLER TOOL COMPANY
1311 Fulton Street
Grand Haven, Michigan

Simplex

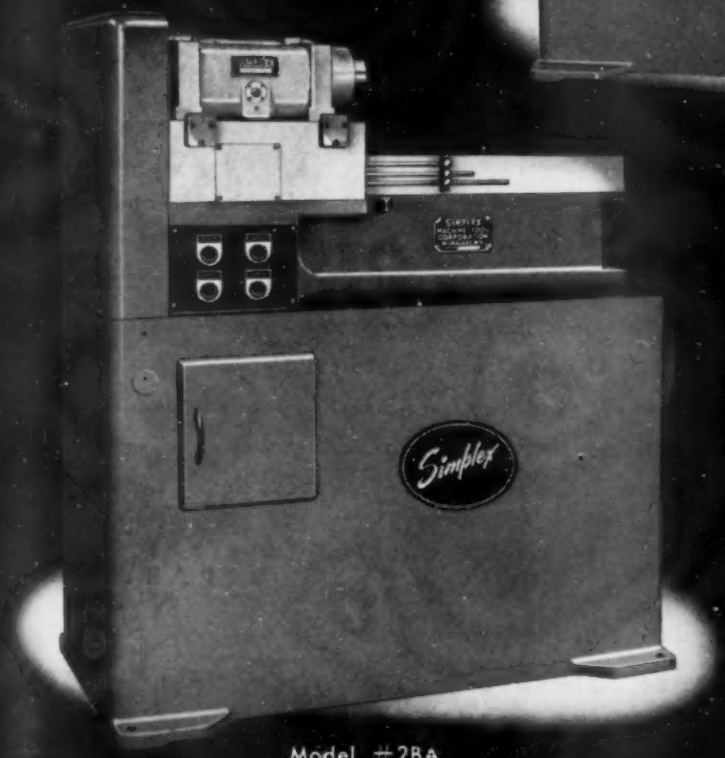
PRECISION BORING MACHINES



Model #2BDA

SPECIFICATIONS

Table Travel	15"
Table Width	13"
Size Heads	#2 or #3
Standard Feeds	1" to 9"/min.
Special Feeds	2" to 18"/min.



Model #2BA

The new SIMPLEX 2BA and 2BDA Precision Boring Machines are offered at a price that will prove attractive to any shop. These machines provide for a complete automatic cycle at a low cost and can be operated by inexperienced help. The automatic cycle consists of rapid traverse, feed, dwell, and rapid return. After the start button is initially pressed, the above mentioned cycle is controlled by the position of trip bars which actuate limit switches. Feed rate changes can be accomplished during setup through use of feed change gears.

Write for Catalog

SIMPLEX MACHINE TOOL CORPORATION

4528 WEST MITCHELL STREET

MILWAUKEE, WISCONSIN

PRECISION BORING MACHINES • PLANER TYPE MILLING MACHINES

SPECIAL DRILLING, TAPPING AND BORING MACHINES

MORE CUTS PER WHEEL . . . Manhattan developments in both rubber and resinoid bonds greatly increase the number of cuts per wheel with Manhattan Cut-Off Wheels. They cut freer and cleaner too . . . on all types of metals. When you specify "Manhattan" you are assured a wheel custom-tailored for your most difficult cut-off problems. You get "MORE USE PER DOLLAR" with Manhattan Cut-Off Wheels because they do a faster, better job . . . and they last longer. Let one of our experienced representatives show you how you can save time and money at your plant with Manhattan Cut-Off and other types of high speed, heavy duty wheels.

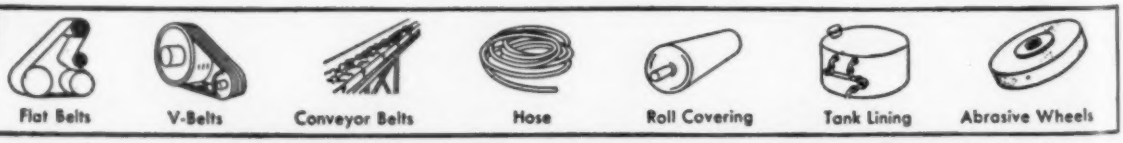
CUTTING WHEEL INSTITUTE MEMBER

WRITE TO ABRASIVE WHEEL DEPARTMENT

R/M

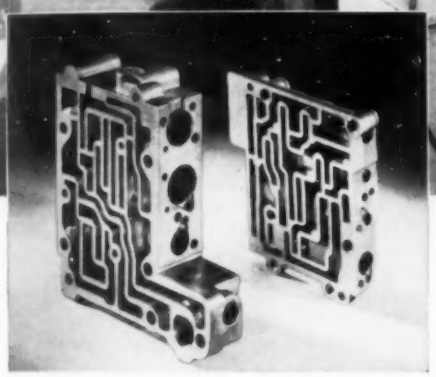
MANHATTAN RUBBER DIVISION—PASSAIC, NEW JERSEY

RAYBESTOS-MANHATTAN, INC.



Other R/M products include: Industrial Rubber • Fan Belts • Radiator Hose • Brake Linings • Brake Blocks • Clutch Facings
Asbestos Textiles • Packings • Engineered Plastic, and Sintered Metal Products • Bowling Balls

RM-435



Holes on extremely close centers vary in diameter from 1/16" to 13/16". The valve body has 33; the cover, 18.

"—BUT OUR PRODUCTION RUN IS LIMITED."

"SO WAS THE RUN ON THIS AUTOMATIC TRANSMISSION PART, BUT". . . .

HERE'S HOW ZAGAR TOOLING SAVED MONEY HAND OVER FIST

This aluminum die casting is processed in its entirety by Zagar planning, except for milling two faces. Two lines of Zagar standardized self-clamping drill jigs ream, tap and drill both valve body and cover. With 24 heads and 24 fixtures, Zagar performs work on 51 holes on close centers. Step tools take care of reaming and burnishing. The fixtures were designed to compensate for slight inaccuracies in the die casting. Thus has Zagar engineering solved an acute problem of limited production without the purchase of costly special machines.

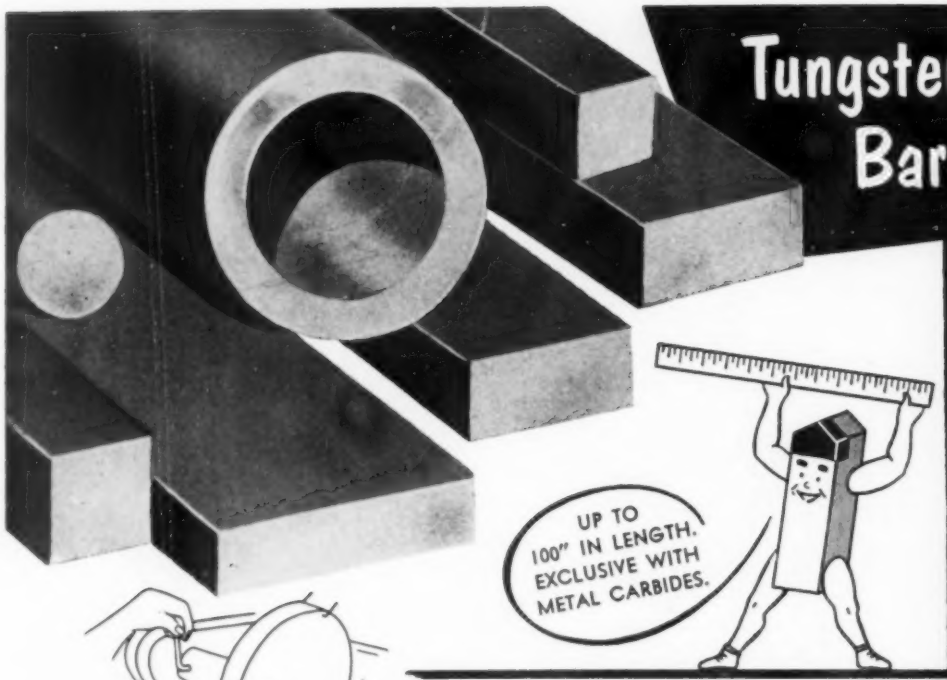
Ask on your letterhead for Bulletin "E-11".

ZAGAR TOOL, INC.

24000 LAKELAND BOULEVARD • CLEVELAND 23, OHIO

Zagar TOOLS FOR INDUSTRY and SPECIAL MACHINERY

Tungsten Carbide Bar Stock



FIRST TO OFFER BAR STOCK CUT TO LENGTH

● Talide Bar Stock cut to any length is available now from these warehouses:

Newark, N. J. ..... 166 Bloomfield Ave.
Detroit, Mich. ..... 20485 Van Dyke
Youngstown, Ohio ..... 107 E. Indianola Ave.
Chicago, Ill. ..... 601 N. Milwaukee Ave.
Los Angeles, Calif. ..... 7799 Telegraph Road

Tubes and rods; and square and rectangular shapes up to ¾" are in stock. On any wear-resistant job, you save money by using Talide Bar Stock.

METAL CARBIDES CORPORATION
YOUNGSTOWN 7, OHIO

● **Large Grinding Wheel Maker** using Talide Bar Stock as core pins for forming bore of refractory wheels during pressing operation reports greater accuracy and concentricity maintained—with service life increased from 3 days to 90 days.

● **A leading Electrical Equipment Manufacturer** blanking .014" silicon steel sheets for transformers has reduced costs 40% by tipping cutting edges of shear blades with Talide Bar Stock. Cleaner cutting action obtained with edge burr eliminated.

● **Leading Eastern Carbon Producer** reports they save 30% on tooling costs finishing their own dies, punches and core pins from Talide Bar Stock. In addition, service life is increased 70 to 1 over steel die assemblies previously used.

● **A Midwest Machine Tool Company** has substituted grinding spindle sleeve bearings made from Talide Bar Stock with result that vibration and whip have been reduced, closer tolerance achieved, and improved finish obtained on parts ground.

Send for new 84-page Catalog 54-G or ask for sales engineer to call.

METAL CARBIDES CORPORATION
MC
TALIDE
YOUNGSTOWN 7, OHIO
SINTERED CARBIDES · HOT PRESSED CARBIDES
HEAVY METAL · CERMETS · HIGH TEMPERATURE ALLOYS
OVER 25 YEARS' EXPERIENCE IN TUNGSTEN CARBIDE METALLURGY

Reduce Broaching Costs
ON SMALL JOBS

OIL GROOVES
•
SMALL SPLINES
•
SERRATIONS
•
KEYWAYS
•
SLOTTING
•
BURRING
•
SIZING HOLES

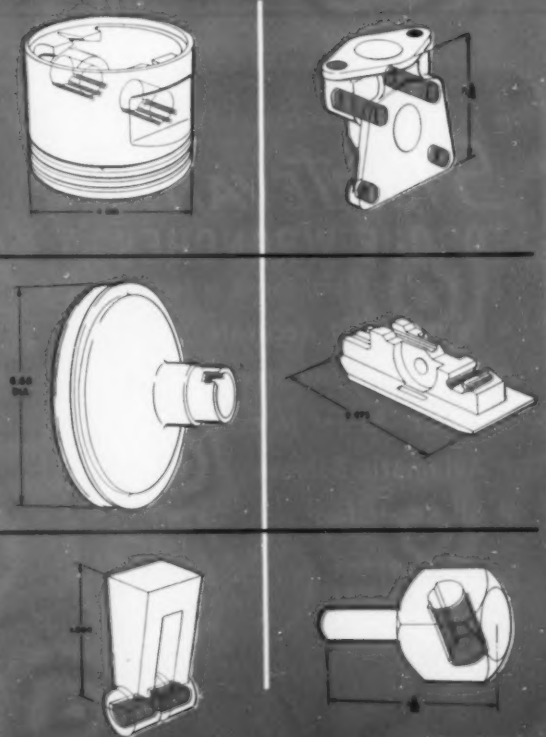
Here is your opportunity to reduce machine time and cut production costs on these small broaching jobs. And you avoid tying up your regular broaching machines which are built for heavier work.

The Red Ring Self-contained Broaching Fixture is a compact, portable, bench-type unit. Specifically designed for a particular job, it has all the elements (automatic and manual) of any well designed fixture. A pneumatic cylinder is added to pull or push the broach. Just connect it with the air supply and you are ready to start broaching.

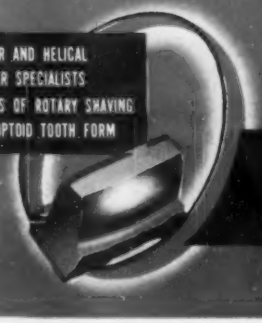
These Red Ring Fixtures are used on a wide range of small jobs requiring a "Pull" not to exceed 2000 lbs. and a stroke of 25" or less. Here they are highly effective and very economical.

Investigate—talk with a Red Ring Engineer or write for Bulletin B54-9.

6978



SPUR AND HELICAL
GEAR SPECIALISTS
ORIGINATORS OF ROTARY SHAVING
AND ELLIPTOID TOOTH FORM



NATIONAL BROACH AND MACHINE CO.

5600 ST. JEAN . . . . . DETROIT 13, MICHIGAN

WORLD'S LARGEST PRODUCER OF GEAR SHAVING EQUIPMENT

CUT COSTS

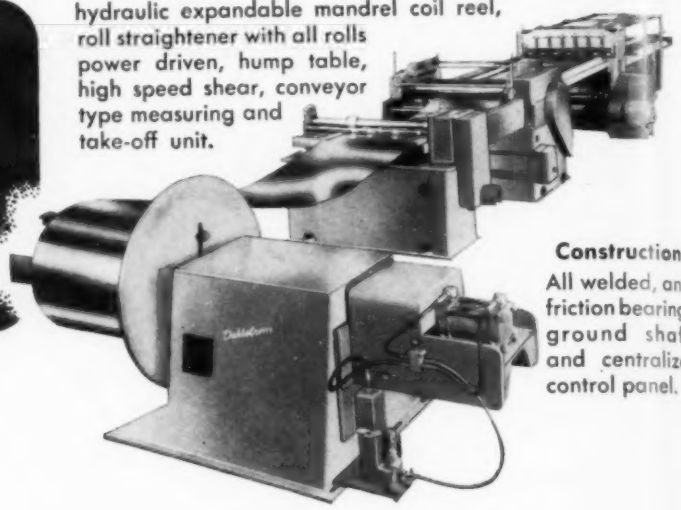
By Using Coiled Steel or Aluminum Instead of Costly Strip Materials

Automatic Decoiling and Shearing by

Dahlstrom

DECOILS—FLATTENS
SHEARS—MEASURES

A Dahlstrom "Complete Line" consists of hydraulic expandable mandrel coil reel, roll straightener with all rolls power driven, hump table, high speed shear, conveyor type measuring and take-off unit.



Construction: All welded, anti-friction bearings, ground shafts and centralized control panel.

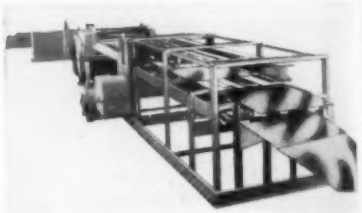
Gauge capacity 12 gauge and lighter.
Widths up to 72".
Cut lengths to specific requirements.
Cutting tolerances of 1/32".
Simplified length adjustment.
Variable speed range 50 to 150 FPM.
Edge trimming also available.

Dahlstrom **MACHINE WORKS**
INCORPORATED

ROLL FORMING MACHINES, COIL REELS, ROLL STRAIGHTENERS, FLYING CUT-OFFS AND DECOILING ROLL FEED LINES

4239 West Belmont Avenue • Chicago 41, Illinois • Phone SPring 7-3670

These units are designed and built to fit your needs. When writing for descriptive data, give complete details of your requirements.



FOR FURTHER INFORMATION, USE READER SERVICE CARD; INDICATE A-11-236-1

Over 85% of the torque wrenches used in industry are

Sturtevant
TORQUE WRENCHES
Read by Sight, Sound or Feel

- Permanently Accurate
- Practically Indestructible
- Faster—Easier to use
- Automatic Release
- All Capacities

in inch grams
...inch ounces
...inch pounds
...foot pounds

Every manufacturer, design and production man should have this valuable data. Sent upon request.

P.A. STURTEVANT CO.
ADDISON QUALITY ILLINOIS

USE READER SERVICE CARD; INDICATE A-11-236-2

MAKE ACCURATE TESTS ANYWHERE!

WITH *Ames* PORTABLE
HARDNESS TESTERS

Ames Portable Tester making hardness test on large casting while being machined.

You can get accurate, dependable tests anywhere, anytime, with Ames Portable Hardness Testers. No delays, no waiting for laboratory tests, no cutting off specimens. Anyone can operate.

Ames Testers are light in weight — may be taken to the work — read directly in the Rockwell Scales. Are made in sizes from 1" to 8" capacity for testing rounds, flats, sheet stock, tubing, odd shaped pieces and assembled parts.

Look into this time-saving, inexpensive method of making your hardness tests today. Thousands in every day use. Send for folder "Rockwell Hardness Testing Made Easy"

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Testing Machines, Inc.
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AMES PRECISION MACHINE WORKS
Makers of Ames Precision Lathes and Bench Millers
WALTHAM 54, MASSACHUSETTS

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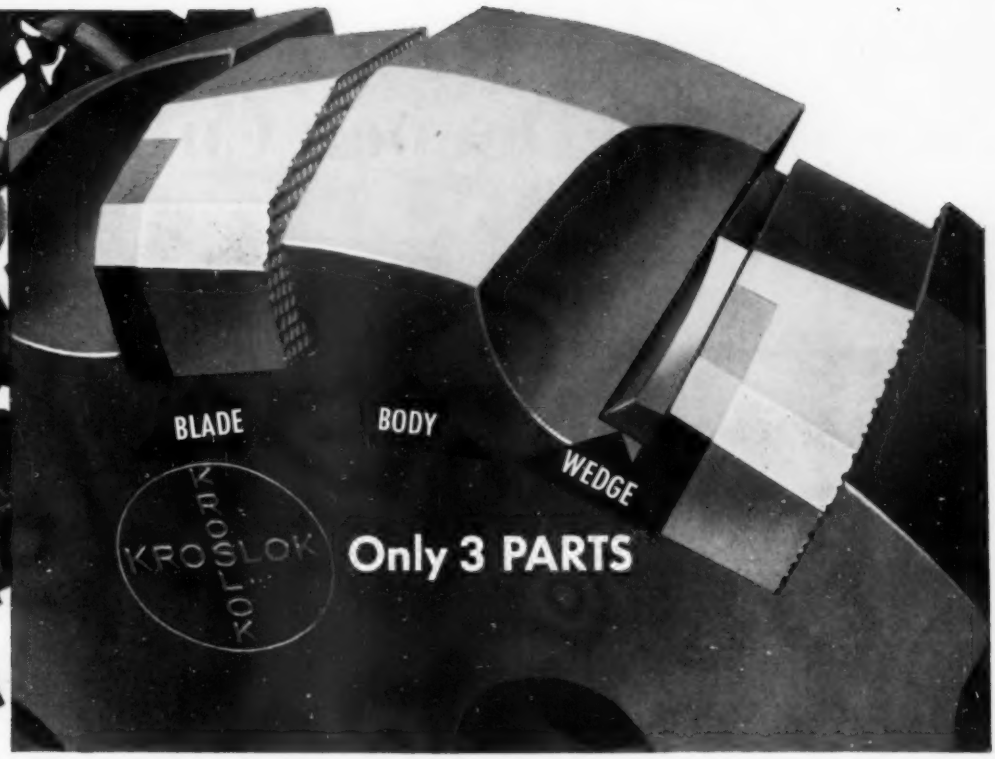
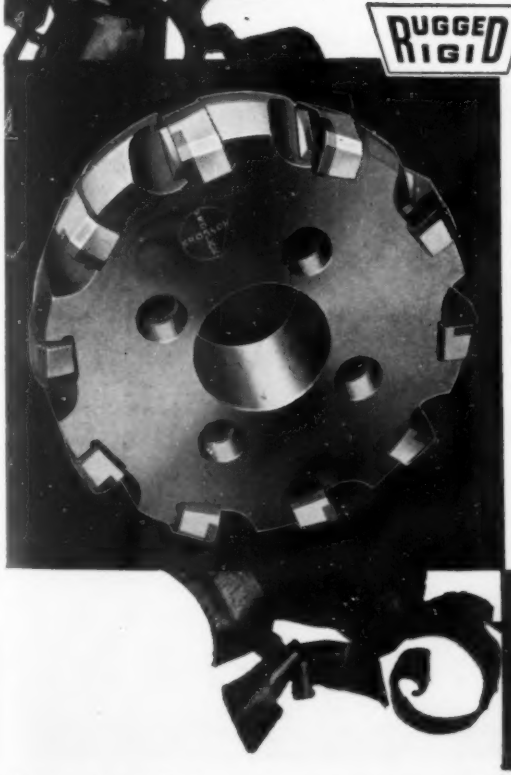


You're "in the Chips"

WITH THE MOTCH & MERRYWEATHER KROSLOK FACE MILLING CUTTER AND SHELL END MILL

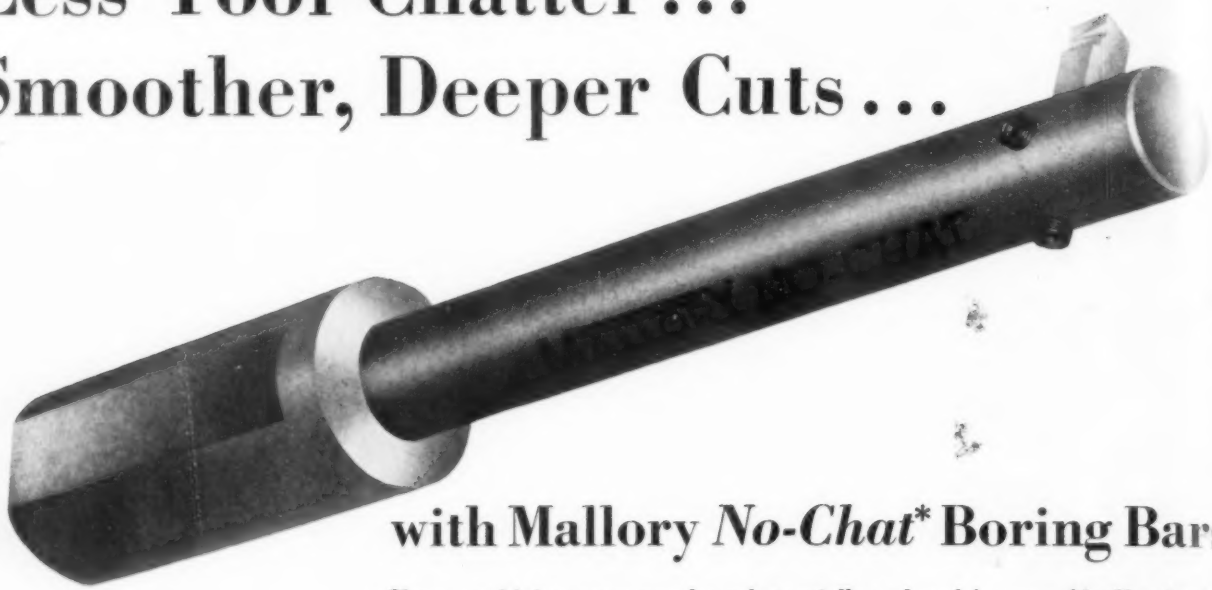


A real *blue chip* investment—KROSLOK. Be sure of positive blade holding which is obtained by immovable wedges and cross serrations mating between body and blade. Extra rugged construction! Reach new production highs by long, uninterrupted service. Make milling more profitable through higher speeds and heavier feeds. *Only three members!* General purpose and heavy duty bodies, each for ferrous and non-ferrous applications; special KROSLOKS to order.

THE MOTCH & MERRYWEATHER MACHINERY CO.

Cutting Tool Manufacturing Division
Cleveland 13, Ohio

Less Tool Chatter...
Smoother, Deeper Cuts...



with Mallory *No-Chat** Boring Bars

Your machining costs can be substantially reduced by new *No-Chat* boring bars—a revolutionary development of Mallory research that practically eliminates tool chatter.

No-Chat boring bars . . . and tool shanks . . . are made of a completely different kind of alloy whose physical characteristics inherently stop tool vibration at its source. Twice as heavy and 75% more rigid than steel, they produce smoother finish even on deep cuts. Their higher price is repaid quickly, many times over, by these cost-cutting advantages:

HEAVIER CUTS—Because chatter is greatly reduced you can set machines to remove more metal per pass.

SMOOTHER FINISH—Clean cuts often require no finish grinding.

LONGER LIFE BETWEEN GRINDS—Cutting edges last longer, due to reduction of vibration. And tools run cooler, for the *No-Chat* tool conducts heat away from the tip three times as fast as steel.

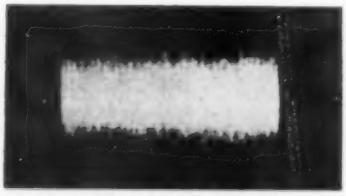
EASY BRAZING—Cutting tip can be brazed readily to the bar with any of a variety of brazing alloys. *No-Chat* is non-annealing . . . eliminates grain growth problems.

RE-USABLE—*No-Chat* boring bars or tool shanks can be used over and over with new tips.

We'll be glad to discuss how this new idea in machine tool technology can put new performance into the tools you use or manufacture. Write today for our Technical Bulletin.

TESTS PROVE HOW *NO-CHAT* REDUCES CHATTER

These oscillograms show the greatly reduced amplitude of tool vibration with *No-Chat* shanks, using identical machine set-ups, when taking a 0.030" cut in low carbon cold rolled steel at 450 SFPM.



With ½" steel shank and style C-8 bit.

With ½" *No-Chat* shank and style C-8 bit.

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eliminate the guesswork in selecting tool steels

½ actual size, Selector is in 3 colors

Thousands of metal working people are using the Crucible Tool Steel Selector to determine exactly which type of steel they need. This handy selector covers 22 tool steels which fit 98% of all tool steel applications.

The selector is unique because it starts with the ultimate use of the steel. It breaks down all tool steel applications into six major classifications, under which the different grades of steel available for certain specific requirements are indicated in legible cutouts. Heat treatment and machinability data are also included for each grade.

A flip of the dial will give you the answer, and almost just as quickly you can get the steel you select. For each type of steel shown on the selector is in stock in Crucible warehouses, conveniently located throughout the country.

To get your Selector merely fill in the coupon and mail. There is no obligation whatsoever.

HERE'S AN EXAMPLE:

Application – Deep drawing die for steel

Major Class – Metal Forming – Cold

Sub-Group – Special Purpose

Tool Characteristics – Wear Resistance

Tool Steel – Airdi 150

A turn of the dial does it! And you're sure you're right

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54 years of Fine steelmaking

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K5H — a performance report on another Kennametal grade with ideas you can use to cut machining costs

Severely interrupted cutting of SAE 4340 forgings with K5H grade, triangular insert in Kennamatic tool.

K5H grade insert tools successfully face aircraft forgings heat treated to 220,000 psi tensile

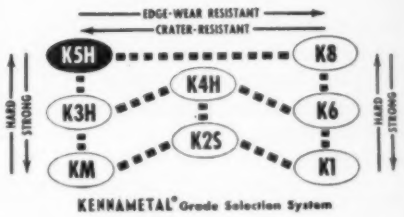
These tough, heat-treated SAE 4340 steel landing gear parts, heat treated to 220,000 psi tensile strength (Rockwell 47C), require severe jump cutting operations.

Using various grades of standard brazed tools, the Menasco Manufacturing Company rough and finish faced both sides at 87 RPM and .0035-inch feed. Even at this relatively low speed and feed, tool life was only two to four pieces per grind. Three cuts were necessary on each side of the forging. Approximately 6.35 minutes were required to change these tools—15 minutes to regrind them.

With K5H inserts in Kennamatic* tools, these forgings are now faced at 150 percent greater speed and twice the previous feed. Only two cuts are required on each face. Rotating the insert to a new cutting edge takes 45 seconds. Since three cutting edges are available on each end of the triangular insert, both sides of 54 pieces are faced before regrinding is necessary. Both ends of the insert are reground in 10 minutes.

K5H is the hardest of the Kennametal* grades. It is highly resistant to cratering, abrasion, galling and pick-up and is available in solid tools and inserts for precision boring and fine finishing of steel at high speeds. K5H is very strong for such a hard material.

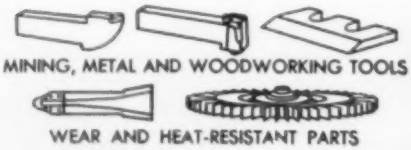
The Kennametal Grade Selection Guide (below) offers you a simplified method for pin-pointing the exact grade of carbide that will assure top tool performance on every machining job. It shows that K5H is the hardest, most crater-resistant of the Kennametal grades. If this grade is being used and cratering is no problem, a change to K8 will provide greater edge-wear resistance. Or, if additional strength is desirable, K3H will improve tool life.



KENNAMETAL® Grade Selection System

Tool breakage, chipping, excessive edge or top surface wear, heat checks and other causes of poor tool performance indicate a need for tool wear analysis. A Kennametal Tool Engineer is ready to help you with these problems . . . to help you select the best grade and tool for any job. In addition to his own broad experience, he has available to him the backgrounds of 150 other Kennametal Tool Engineers. He's as near as your telephone. Call him, or write to KENNAMETAL INCORPORATED, Latrobe, Pennsylvania.

*Registered Trademark A25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WEAR AND HEAT-RESISTANT PARTS

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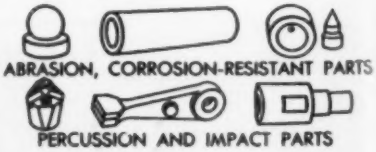
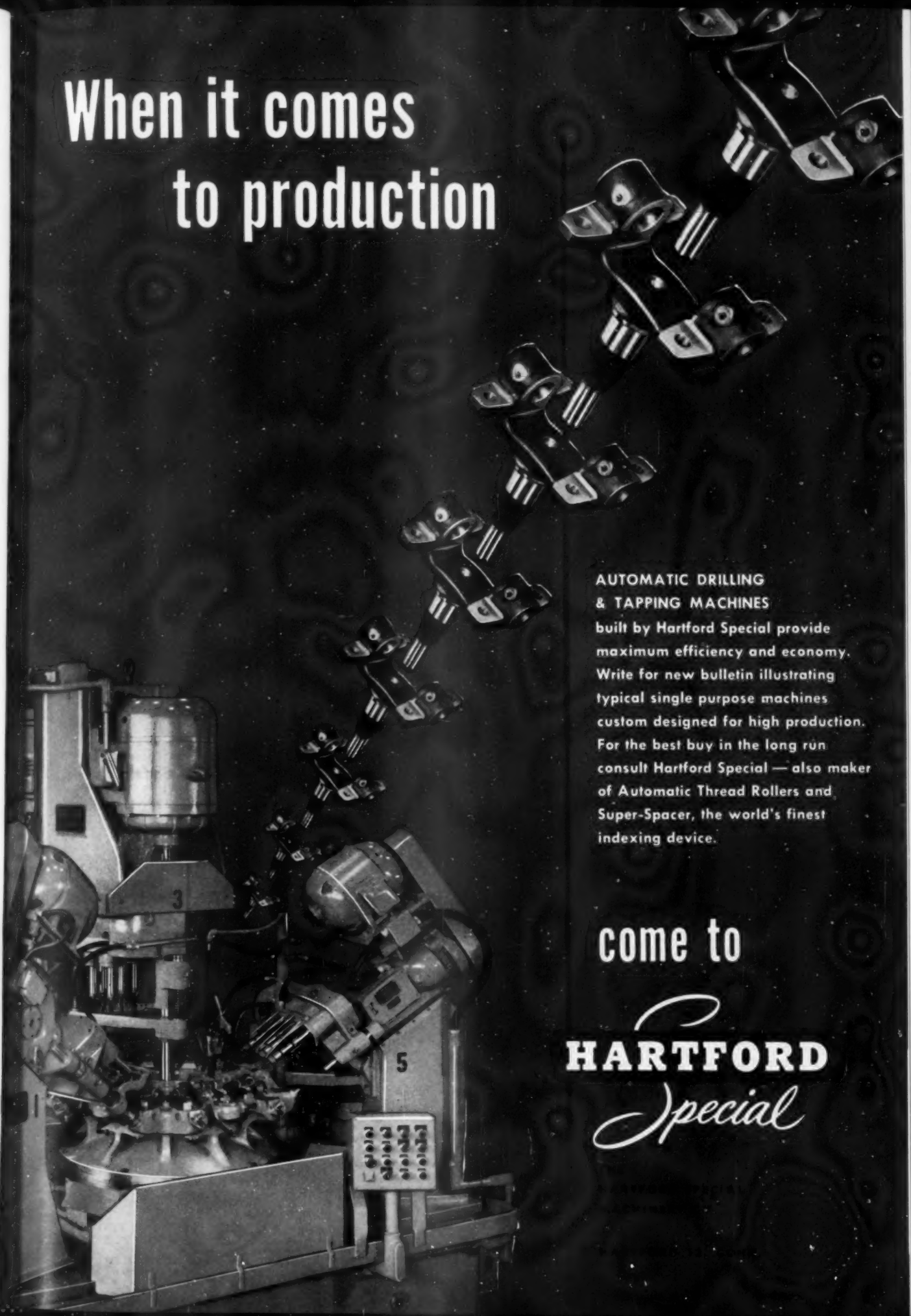

ABRASION, CORROSION-RESISTANT PARTS
PERCUSSION AND IMPACT PARTS

When it comes to production



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⅛" thick by ⅞" wide by 2¾" long

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Primary Stop ..... $6.00 doz.

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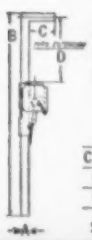


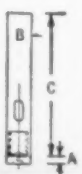
Automatic Stop

Cat. No.	A	B	C	D
9-11-6	3/16"	5"	5/8"	3"
9-21-6	1/4"	6"	3/4"	4"

Specify right or left hand

Primary Stop

Cat. No.	A	B	C
9-31-6	1/16"	3/8"	2 3/8"
9-41-6	3/32"	3/8"	2 3/8"
9-51-6	1/8"	3/8"	2 3/8"



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made with the craftsmanship of lifetime specialization in Tool Steel—exclusively

Hotform The first 5% chromium hot work die steel—still first in strength and toughness combined with high resistance to heat checking. *Uses:* die casting dies, dummy blocks, extrusion dies, backer blocks, mandrels, hot piercers, hot forging dies.

Forge Die Resists softening at elevated temperatures, stays put under impact. 14% tungsten content. *Uses:* forge die inserts, extrusion dies, gripper dies, hot pressing dies, dummy blocks, hot piercing tools.

SC Special 14% tungsten plus increased carbon for higher wear resistance. *Uses:* hot forging dies and punches, extrusion tools, hot forming rolls.

Marvel 10% tungsten for high resistance to high temperatures. *Uses:* brass forging dies, extrusion press tools, nut dies and piercers, hot shears, hot swaging dies.

Hotpress Outstanding tungsten die steel with excellent toughness for work at elevated temperatures. *Uses:* dummy blocks for brass extrusion, press dies, extrusion dies, upsetting dies.

WW Hotwork Highly alloyed for greatest wear resistance at high temperatures. *Uses:* copper and brass extruding dies, brass die casting dies, copper tubing piercers, nozzles for zinc die casting machines.

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*guaranteed by deep etch, magnaflux, zyglo, and supersonic testing

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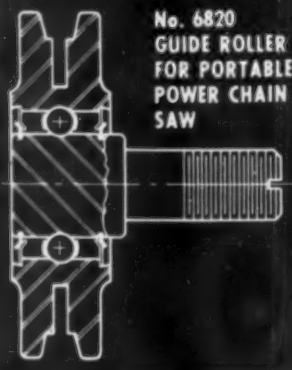
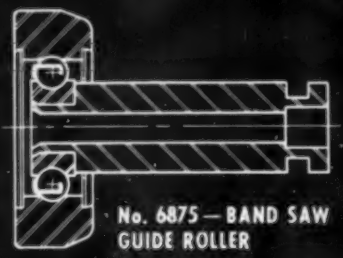
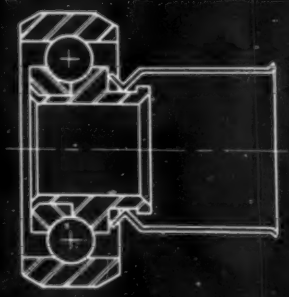


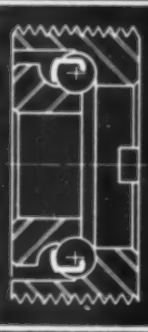
No. 6820 GUIDE ROLLER FOR PORTABLE POWER CHAIN SAW



No. 6875 — BAND SAW GUIDE ROLLER



No. 6661 BEARING FOR IMPRESSION ROLLER SHAFT OF DUPLICATING MACHINE



No. 6959 THREADED O. D. CADMIUM PLATED BEARING FOR RADIO TUNING DEVICE

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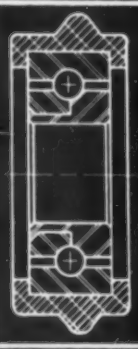
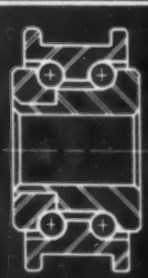
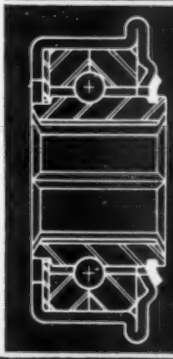


No. 7025 NYLON TIRED ZINC PLATED ROLLER FOR DISHWASHER

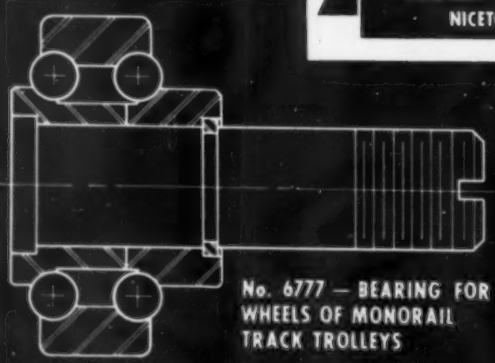
No. 6788 GRAVITY ROLLER CONVEYOR BEARING



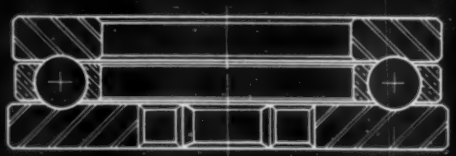
No. 6970 GUIDE ROLLER FOR SHEET METAL TRIMMER



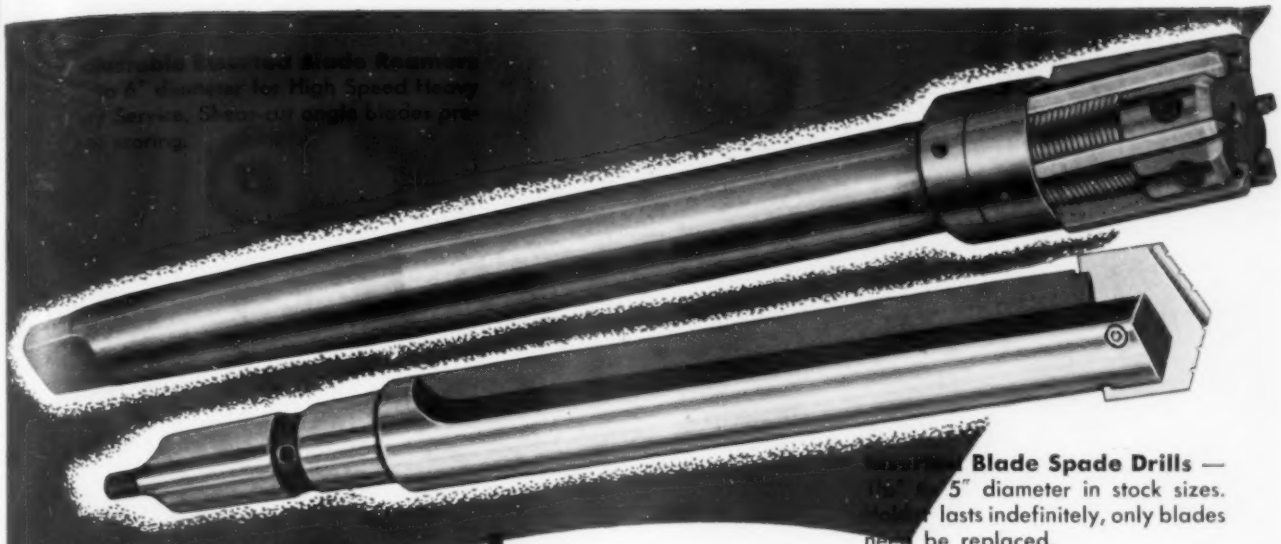
No. 6768 BEARING FOR CONVEYOR ROLLERS



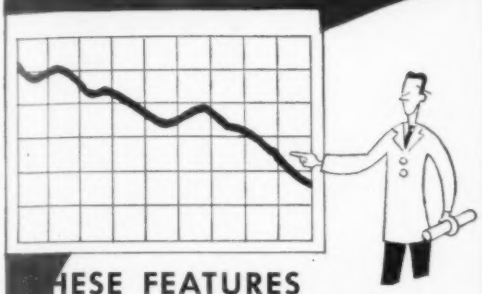
No. 6777 — BEARING FOR WHEELS OF MONORAIL TRACK TROLLEYS



No. 6579—THRUST BEARING FOR IMPACT WRENCH



Blade Spade Drills — 5" diameter in stock sizes. lasts indefinitely, only blades need be replaced.



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Now you can get HUNDREDS OF NEW STOCK SIZES of Simonds high-grade, precision-ground tool and die steel . . . sizes that save you more time and money . . . sizes that formerly were special but now are available from stock at regular prices. Now you can get "1001 sizes for 1001 uses" . . . with your choice of OIL or AIR Hardening type steel in 18" and 36" lengths.

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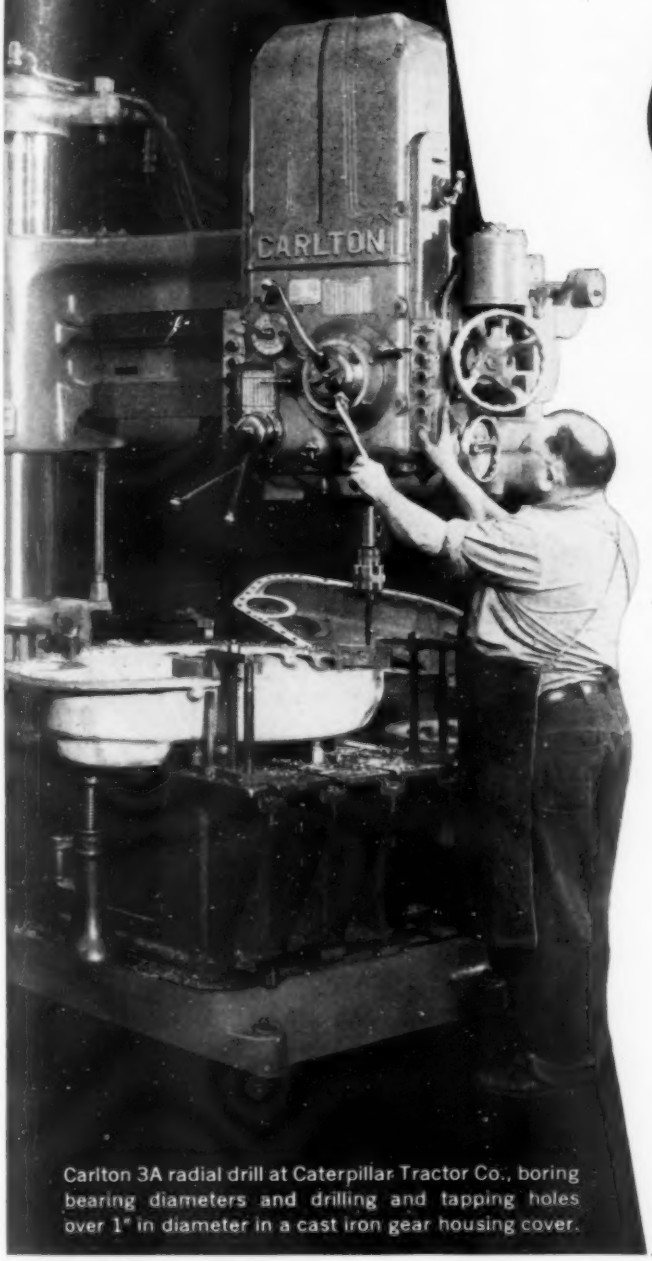
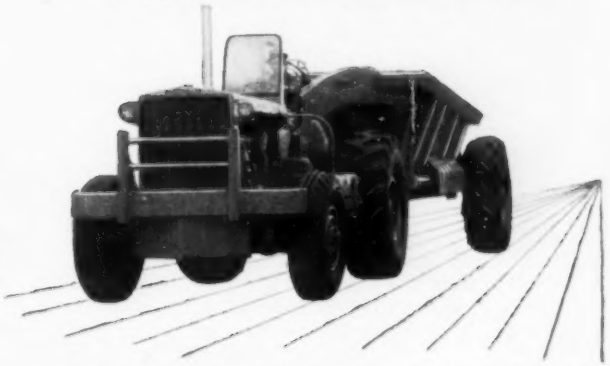
Caterpillar®

gets fast, accurate, heavy duty drilling with

Carlton
radial drills



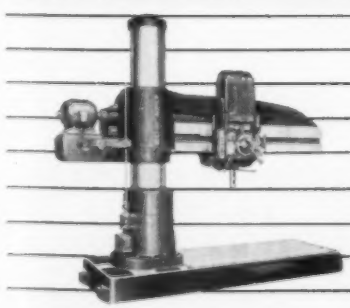
Carlton 3A radial drill at Caterpillar Tractor Co., boring bearing diameters and drilling and tapping holes over 1" in diameter in a cast iron gear housing cover.



Drilling at Caterpillar Tractor Co. is strictly large scale . . . yet it must be fast and accurate. That's why Caterpillar uses Carlton Radial Drills. Carlton has everything you need for today's hole drilling precision and production: pushbutton control, super-precision column clamp, 3-unit power clamping, low hung drive, positive tooth feed clutch and easy, economical maintenance.

You're sure to find your most economical size here, too, because the Carlton line includes arm lengths from 3-ft. to 12-ft., column diameters from 9" to 26".

Check Carlton . . . the *one* radial drill that assures you of maximum hole drilling production, precision performance today and tomorrow, and owner *and* operator satisfaction. Why not write today for the 'hole' story.



The Carlton Machine Tool Co., Cincinnati 25, Ohio.

The Carlton Machine Tool Co. Cincinnati 25, Ohio

Please send us descriptive bulletins on Carlton radial drills in sizes indicated:

Arm	Column
____ft.	____in.
____ft.	____in.
____ft.	____in.

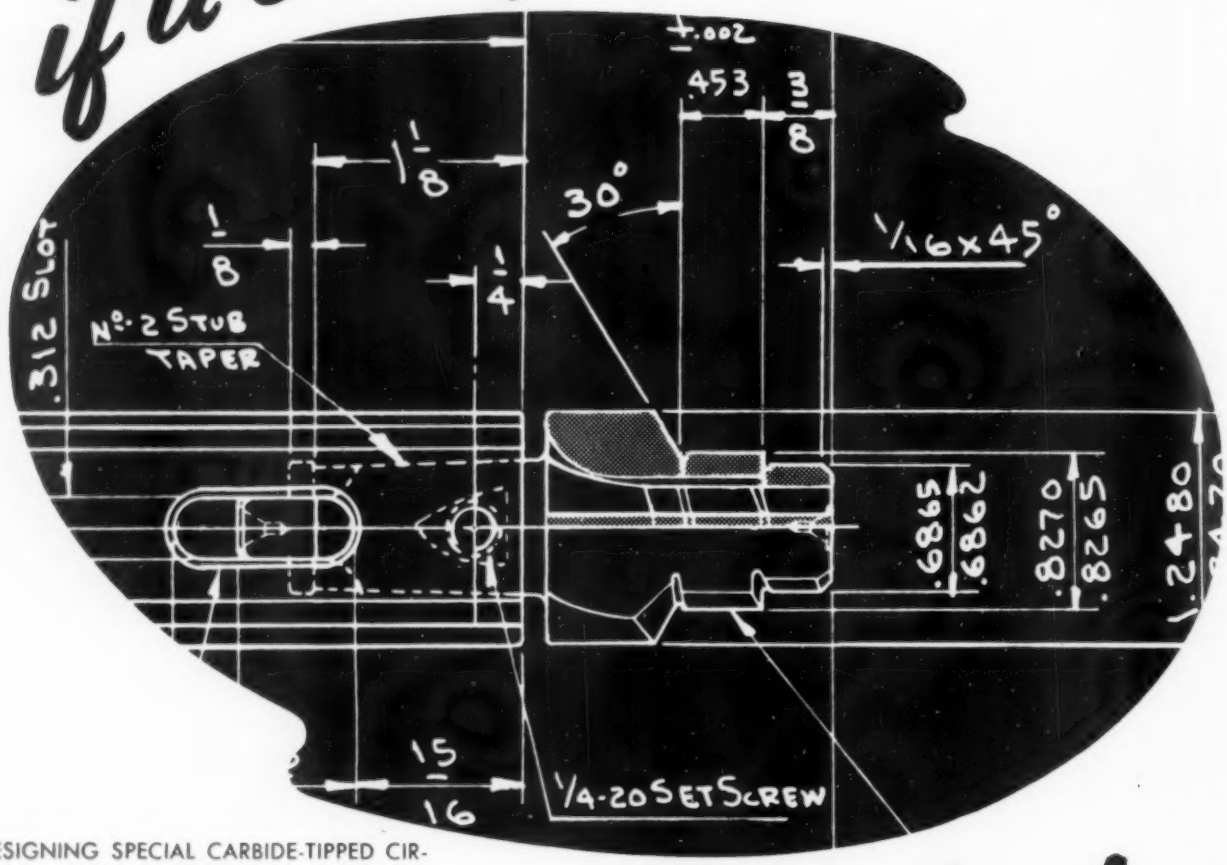
Name_____

Company_____

Street_____

City_____ Zone____ State_____

if it calls for Specials...



DESIGNING SPECIAL CARBIDE-TIPPED CIRCULAR CUTTING TOOLS is an important part of Staples' service to the metalworking industry.

call on Staples!

Hundreds of manufacturers have turned troublesome, costly, "special" hole production jobs into smooth-running, high-performance operations by taking their problems to Staples. Special Tool Design and Engineering Service is available upon request.

Leaders in the field of circular carbide-tipped tool manufacturing, Staples' expert tool engineers can meet your most rigid specifications with special tool designs that will speed your production and deliver precision results, while reducing your tooling costs.

If your production requires—or would benefit from—special tooling, put Staples to the test. You'll profit in improved performance at lower costs as many others have. A brief description of your job requirements will bring a prompt response.

Staples **CARBIDE-TIPPED CUTTING TOOLS**

A complete line of Standard Circular Carbide-Tipped Tools, Expansion Reamers.

THE STAPLES TOOL COMPANY, Cincinnati 25, Ohio

WESSONMETAL
Carbide Blanks

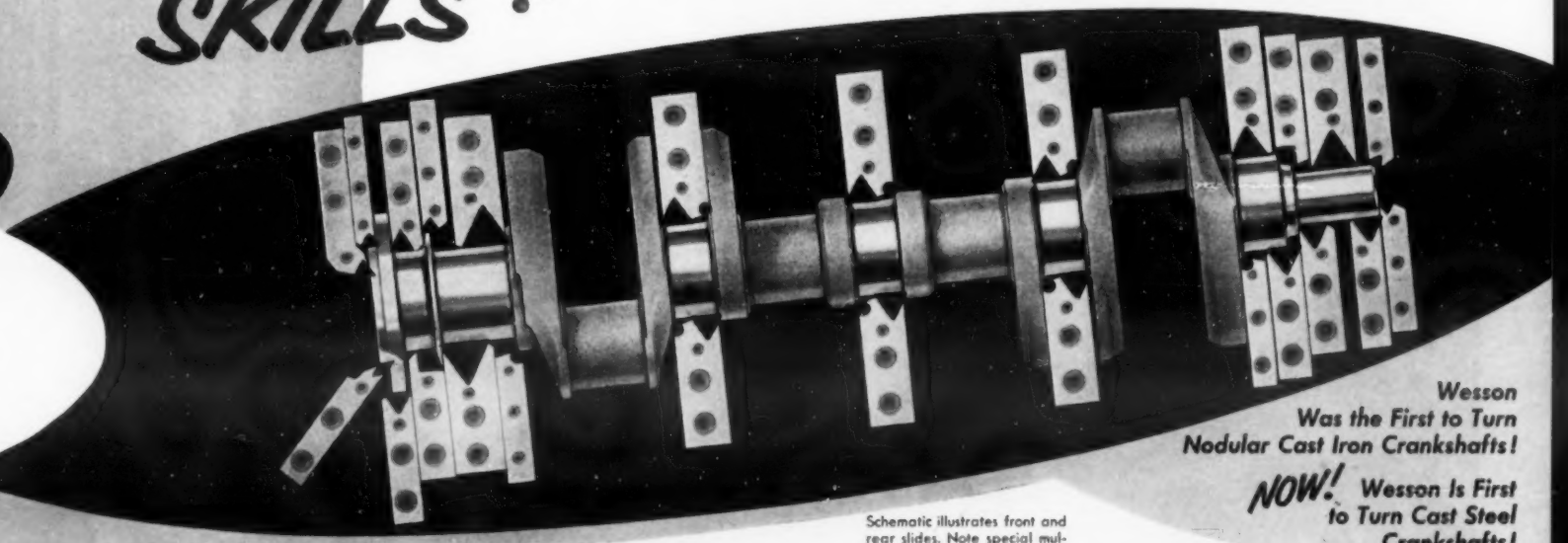
WESSON
Carbide Cutting Tools
ENGINEERED FOR CLAMPS

WICKES

COMBINED SKILLS ..... FIRST TO TURN CAST STEEL CRANKSHAFTS!

WORKING TOGETHER FOR THE BENEFIT OF ALL TO CREATE . . .

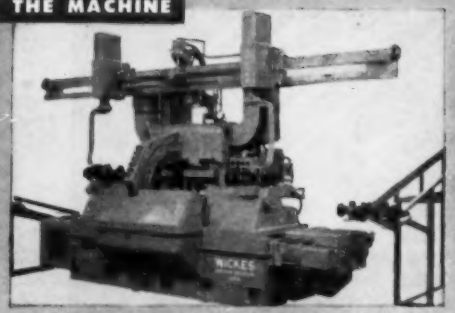
- More Productive Tools
- More Productive Machine Tools
- More Uniform Quality Carbide
- Lower Costs



Wesson Was the First to Turn Nodular Cast Iron Crankshafts!

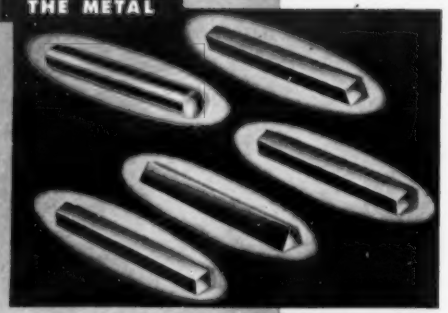
NOW! *Wesson Is First to Turn Cast Steel Crankshafts!*

THE MACHINE



Wickes lathes used on this tough operation are the result of engineering-design experience gained from many years of solving hundreds of specific machine tool problems.

THE METAL



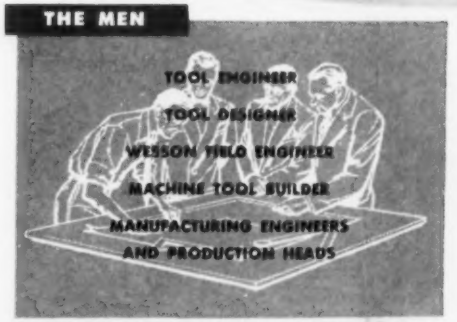
Wessonmetal uniformity of grade is the key to outstanding performance in single and multiple insert set-ups on all types of material. Every Wessonmetal insert or batch of inserts is engineered to out produce on every type of operation. Wessonmetal uniformity is the result of unique and exacting quality control.

THE TOOLS

Schematic illustrates front and rear slides. Note special multiple tool adaptations possible *only* with Band-Type Multicuts!

Wesson Multicut Band-Type Tool Holders are tailor-made for single and multiple tool set-ups. Exclusive features include "built-in flush gage" for quick, accurate insert set-up" in the machine; low cost steel band is replaceable, insert removal slot permits fast and easy insert removal. The body is practically indestructible! Available in over 100 standard sizes—11 styles!

THE MEN



Credit lines above are typical of Wesson's thorough approach to "tough" tooling problems." Working together with the metallurgist, the Tool Engineer, Machine Tool Builder, and the customer, Wesson Field Engineers combine skill and experience in the solution of big jobs like the steel crank and single point tool applications in small production runs!

WESSON METAL CORPORATION
LEXINGTON, KENTUCKY

WESSON COMPANY
1220 WOODWARD HEIGHTS BLVD., FERNDALE 20, MICHIGAN

Saves $11,549 a year with one DENISON MULTIPRESS®

...all on a $3,000 investment. At Penn Controls, Inc., the former method of staking or riveting with a mechanical press was too slow . . . actually scrapped 376 pieces a day due to variations in size of components.

Now, women operators simply load the six parts of the magnetic switch onto the index table of a 4-ton Denison Multipress. With one smooth hydraulic stroke of the Multipress ram, parts are accurately staked together . . . saving $7,345 a year on scrap reduction alone.

With the same labor, Multipress has nearly doubled production.

Staking is one of hundreds of different jobs performed by the Denison hydraulic Multipress. For bulletins and case studies of applications in the 1 to 75-ton pressure range, write to:

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DENISON ENGINEERING COMPANY
1182 Dublin Road • Columbus 16, Ohio

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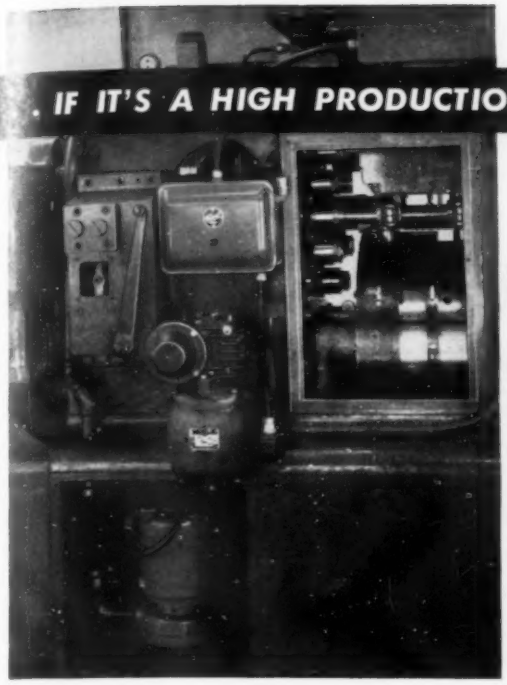
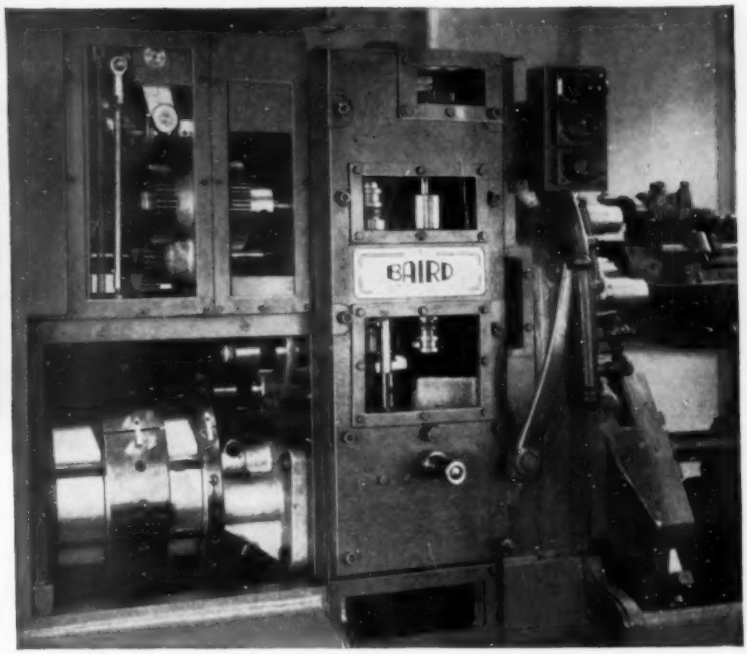
MOTORS • PUMPS • CONTROLS

. . . IF IT'S A HIGH PRODUCTION PROBLEM . . .

ASK BAIRD ABOUT IT





HERE'S BAIRD'S *Guinea Pig*

WHERE WE WATCH OUR OPERATIONS . . . *FOR YOUR BENEFIT*

One of the features of Baird machines that customers like best is that when they are tooled and put on production . . . they produce. In many cases, however, arrival at that happy result in our customer's plant is by no means as simple as it sounds. Hence our "Guinea Pig" and other special Baird engineering procedures. The "Guinea Pig," as you can see from this photograph, is just that . . . a regular Baird Multiple Spindle Automatic, with plastic windows let into its "hide" at many vital points. By this means we can check details of operation under controlled conditions. Cams, gearing, controls, interlocks, tool slide action, temperatures, lubrication, wear . . . just about every factor in performance . . . is seen, gaged and compared.

And that, we believe, is typical of Baird's whole approach to high production machinery and tooling. For years, people have said "ASK BAIRD ABOUT IT" only because they know we will give them the right answer. Send in your inquiries, gentlemen — we're never too busy to help.

THE BAIRD MACHINE COMPANY
STRATFORD CONNECTICUT

WHERE YOU WILL GET THE HELP OF SPECIALISTS ON THESE ESSENTIAL PRODUCTION PROBLEMS:

AUTOMATIC MACHINE TOOLS • AUTOMATIC WIRE & RIBBON METAL FORMING MACHINES • AUTOMATIC PRESSES • TUMBLING BARRELS

1BA54

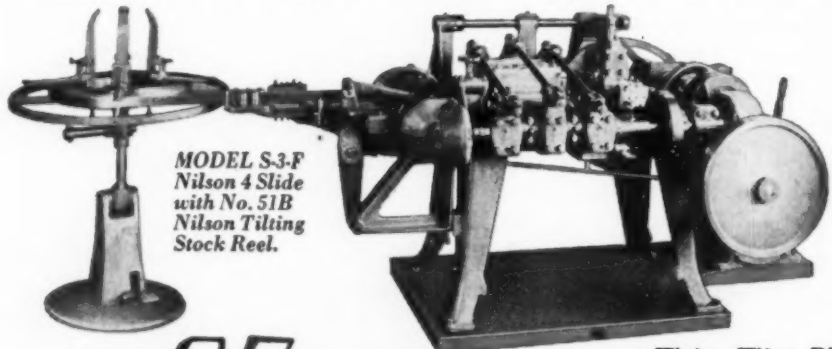
"Switching to NILSON 4 SLIDES Saved us $17,656 on metal alone"

Yes, simply by changing stamping methods, this NILSON Customer profited 4 ways:

1. Production increased 80%.
2. 72% less metal used (per 4 million pieces).
3. Greatly improved quality with minimum of rejects.
4. Strengthened competitive position with greater profit margin.

You, too, can enjoy these advantages in producing your own wire forms and small metal stampings. Parts such as illustrated in the margin were straightened, fed, pierced, blanked, swaged, stamped or coined, cut-off and formed AUTOMATICALLY in NILSON 4 SLIDES in one quick precise operation. *ONE* Machine. *ONE* Operator.

NILSON 4 SLIDES available in wide range of sizes: forming Wire up to ½" diam. in feeds to 32" max. and Metal Ribbon stock up to 3½" wide. Press sections 5 to 30 ton capacity. Heavy Duty Types in 50 and 75 ton models.



MODEL S-3-F Nilson 4 Slide with No. 51B Nilson Tilting Stock Reel.

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Write, Wire, Phone for full particulars.

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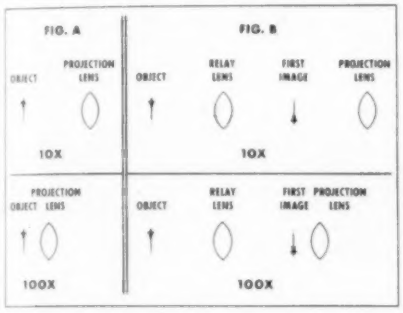
Automatic Chain-Making Machines • Automatic Staple Forming Machines • Wire and Stock Reels • Foot Presses • Wire Straightening Equipment • Slide Feeds for Presses

Plain Pointers on Projection

ALTHOUGH we frequently speak of magnifying an object 100× with the Kodak Contour Projector, technically we do not magnify the object at all. Instead we magnify its image, as formed by a relay lens. This relay system, diagrammed in Fig. B, forms an image of the object at a ratio of 1 to 1. The magnifying optics in turn pick up this image and enlarge it from 10 to 100 times.

Since the end result is the same—an enlarged image of a part on the screen—this might seem a roundabout system to the uninitiated. On the contrary, there are logical mathematical reasons for it. One of the more restrictive factors in conventional optical systems is expressed by the formula, M = id/od; that is, magnification equals the ratio of the image distance to the object distance. In practice, where image distance is limited, this entails using lenses of short



focal length for high magnifications. The lens is moved close to the work, decreasing object distance and unfortunately decreasing at the same time the size part which may be checked (Fig. A).

It was to overcome this limitation that our optical experts incorporated the relay system in the Kodak Contour Projector. Since this system merely images the part at unity, the focal length of the relay lens can be comparatively long—in this case eight inches. And the magnifying optics can be moved as close as desired to the image formed by the relay. As a result, users of our projector have a full eight inches in which parts may be staged, regardless of the magnification desired. This permits checking form tools, shafts, and other bulky parts.

If this were all that the relay accomplished, it would be justified design wise. However, it also makes it practical to incorporate in the projector a lens turret in which lenses of varying magnifying power may be mounted. With such a turret, magnification is changed by merely twisting a dial and the part remains in focus at the new magnification. This is a handy feature, and only one of a number of optical features of the Kodak Contour Projector to be discussed in this space.

You can inspect long parts at all magnifications ...with the Kodak Contour Projector

THIS seven-inch-long cycle timing part must be inspected for tooth contour, location and spacing of two cams, shaft diameter, shoulder spacing, and form, size, and runout of the lead screw. All these dimensions may be quickly checked on the Kodak Contour Projector. That's because the Kodak Contour Projector provides an unvarying 8" clearance between lens and object at all magnifications. (The column at the left tells you why.)

The exceptional versatility of the Kodak Contour Projector permits this part to be completely inspected in six positions, at several different magnifications, and using both surface illumination and silhouette projection. And the job requires little training, is done quickly and easily.

Whether for toolroom use or production assembly and inspection, you'll find a Kodak Contour Projector will get the work out in a hurry. With an appropriate chart-gage and fixture you can inspect all sorts of complex parts, large and small. There is a field representative in your area who will answer your questions. To get in touch with him, or for a copy of a new booklet, "Kodak Contour Projector," write to:

Special Products Sales Division
EASTMAN KODAK COMPANY
Rochester 4, N. Y.

the KODAK CONTOUR PROJECTOR

Optical Gaging

A new sound movie, Optical Gaging, shows how to simplify complex inspection problems. We'll tell you how to get it for a showing.

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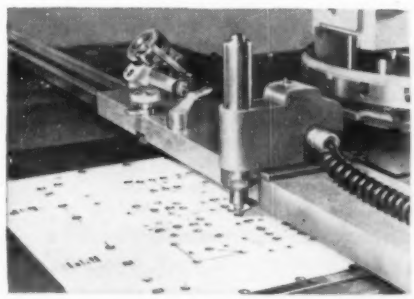
SAVE 90% with a WIEDEMANN

The RA-41P Turret Punch Press *Pays for itself in 2 YEARS or LESS*

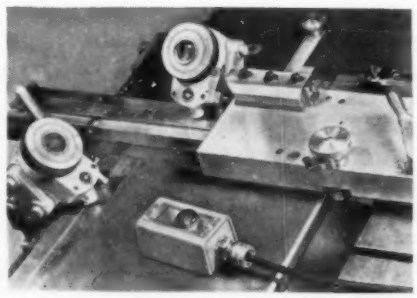
Save 90% on PIERCING

- Unmatched for high speed, low cost duplication of intricate hole patterns in flat sheet metal—low to medium production quantities.
- 18 or 20 punches and dies in turrets ready for use.
- Hole locations are made to a color-coded template—50 or more holes per minute.



Save 90% on TEMPLATE MAKING

- Press can be supplied with optical dimensioning instruments for template making.
- These templates are used with the RA-41P as well as for other applications. Drill jigs, prototypes, etc. are also produced to a tolerance of ±.002″ in 10% of the time usually required.



Wiedemann ships each press tooled—ready to produce your parts as soon as the machine is leveled and connected to your power line.

Wiedemann engineers will be pleased to study your drawings and show how these savings can be yours.

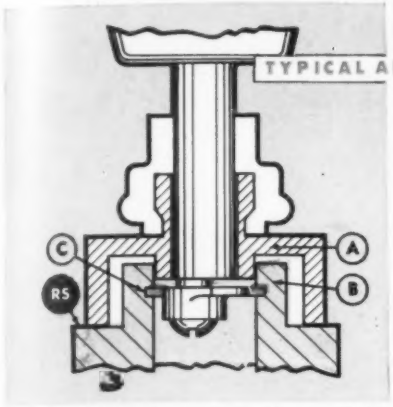
Write for a copy of Bulletin 241

WIEDEMANN MACHINE COMPANY

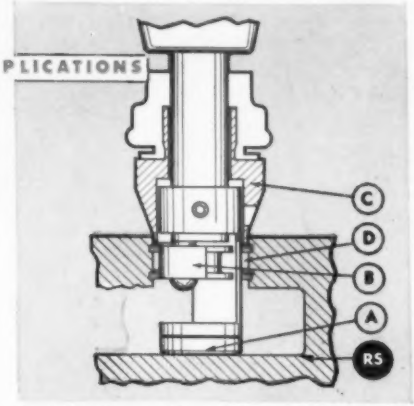
4245 Wissahickon Avenue, Philadelphia 32, Pa.

Waldes Truarc Grooving Tool Out-Performs Conventional Recessing Tools

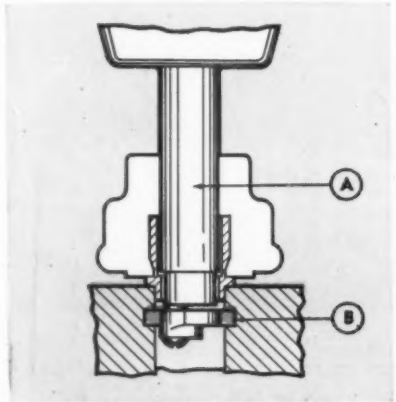
SAVES TIME! CUTS COSTS! NEEDS NO SKILLED LABOR!



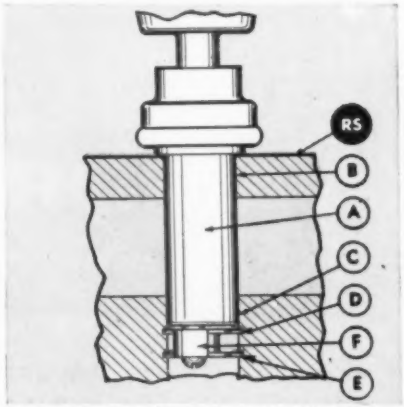
Clearing Obstructions or Protrusions — Waldes Truarc Grooving Tool with *special bushing* with high shoulder A in order to clear obstruction B on reference surface RS so groove can be properly located in bore.



Locating Grooves from Bottom of Hole or Blind Hole—Use of *bottom adaptor* A and double cutter B. Bushing C pilots tool into bore D while bottom adaptor acts as stop to locate grooves from reference surfaces RS below bore.



Small Diameter Bore — Need for Wide Groove — Great versatility of tools allows A-2 Tool to accept *stepped down spindle* and *cutter-shaft* assembly A. Provides cutting capacity in a bore normally within the range of smaller A-1 Tool. Illustrated, larger tool capacity necessary to cut groove diameter B exceeding normal capacity of standard A-1 Tool.



Extending Reach of Tool — Waldes Truarc Grooving Tool assembled with *extended bushing* A increases normal range of tool in order to reach proper groove location in bore. Bushing also registers on reference surface RS of workpiece while piloting tool at two points B and C inside bore. Two grooves D and E are cut simultaneously with double cutter F.

AMAZINGLY VERSATILE! The Waldes Truarc Grooving Tool adapts quickly and simply to your toughest recessing requirements. With it, even *unskilled labor* can perform and maintain high precision, mass production operations.

WIDE CUTTING RANGE! The Waldes Truarc Grooving Tool comes in five models: A-1, A-2, A-3, B and C. This wide variety of models enables you to cut accurate grooves in housings with diameters from .250 to 5.000 inches. Special features, modifications and adaptations allow each model to operate efficiently under many varying conditions.

SEND YOUR PROBLEM TO WALDES! Whatever your internal grooving problem, send us your blueprints and let Waldes Truarc engineers give you a complete analysis, price quotation and delivery information on the most economical tool set-up for your particular job.

WRITE NOW FOR 20 PAGE TECHNICAL MANUAL CONTAINING FULL ENGINEERING DATA

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GROOVING TOOL

MADE BY THE MANUFACTURERS OF WALDES TRUARC RETAINING RINGS.

WALDES KOHINOOR, INC., 47-16 Austel Pl., L.I.C.1, N.Y. Waldes Truarc Grooving Tool mfd. under U.S. Pat. 2,411,426

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Waldes Kohinoor, Inc., 47-16 Austel Place
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a difficult piece to HARDEN . . .

. . . yet it gave no trouble

thanks to SAGAMORE DIE STEEL

Note the complex section of this small ratchet driven friction clutch. Yet, with non-deforming Sagamore Die Steel, there is no distortion or size variation in the intricate webbing.

After being machined from a 3" round bar of Ludlum Sagamore, the clutch was hardened from 1775 F. The piece was air cooled and then drawn at 600 F. The result, a Rockwell C hardness of 55/56.

Ludlum Sagamore is a relatively new type of non-deforming die steel which has had a rapid increase in popularity. It combines excellent non-deforming properties and unusual toughness with freedom from hardening hazards. Similar to high carbon-high chromium steels in behavior and applications, Sagamore has the added advantages of lower hardening temperatures, easier machining and grinding, greater toughness and lower costs.

There's an A-L tool steel to help solve your toughest tool steel problems. Call your nearest office or distributor today, or write *Allegheny Ludlum Steel Corporation, Oliver Building, Pittsburgh 22, Pennsylvania.*

Write for your
SAGAMORE BLUE SHEET

A concise 4-page booklet of facts on the handling and shop treatments of Sagamore. Included is complete information on forging, annealing, tempering, etc. and detailed laboratory data on physical characteristics. *Ask for your free copy.*

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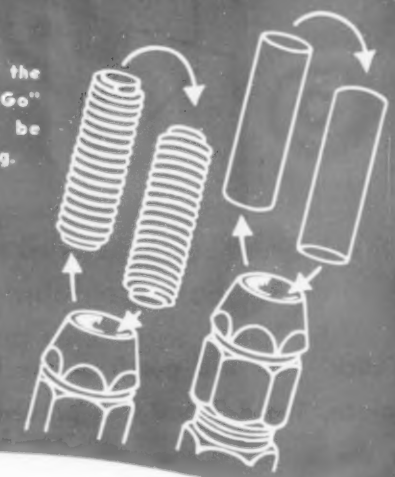
REVERSIBLE THREAD AND CYLINDRICAL GAGES

give at least twice the wear of Taper Lock Gages

Either end of the "Go" and "Not Go" members may be used for gaging.



FEATURES

- 2 Gages for the price of 1
- Adjustable for use as a depth gage
- Color identification for "Go" and "Not Go"

Cut gaging costs in half by doubling the hours of precision gaging with BATH Reversible Gages. They're made to the same uniformity and high quality standards as Bath Regular Thread Gages and Bath Ground Thread Taps.

Special gages to your specifications

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RING THREAD GAGES • PLUG THREAD GAGES
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COMPANY_____

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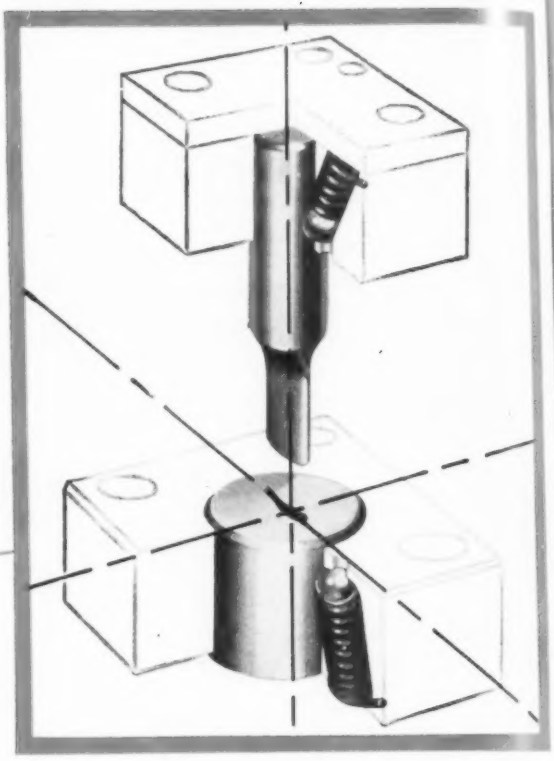
WHY R-B Punches are easier to use



Just a push, a twist, and "click" your R-B punch or die button is accurately ALIGNED and LOCKED in place. The R-B ball lock prevents radial or vertical movement of the punch or die button in the retainer—no additional keying is required.

R-B punches and die buttons are just as easy to remove—simply insert tanged tool in retainer hole to release ball lock. Standardized and completely interchangeable in any shape or size, these easy to use punches and die buttons save your time and energy.

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Please send me additional information.

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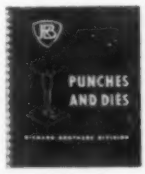

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SPECIAL COLD FORGED PARTS
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SHEET METAL DIES MADE OF FERROUS ALLOYS, ZINC ALLOYS OR PLASTICS

Portable Electric Tools, Inc.
Chicago, Illinois

Product:	PET electric hand saw, model 625L
Problem:	To find a material for a helical gear that would mate well with a hardened steel pinion. It also had to withstand heavy loading, shock, and reasonably severe wear. Ordinary bronzes first used couldn't "stand the gaff" on this application. Of the first 1,000 saws, approximately 40% failed on test because material did not meet gear standards established by PET Engineering Department.
Solution:	**AMPCO METAL**
Results:	Ampco Metal's remarkable strength and wear resistance helps give PET saws the guts to take tough, day-in, day-out service. Since the change to Ampco Metal, gear failures have been eliminated.

PET® POWER TOOLS

shift gears to AMPCO* METAL

Eliminates gear failures; gives portable saw long, dependable life under severe operating conditions.

WHETHER used for a small gear, as illustrated, or for a 6-ton turbine runner, Ampco Metal's toughness and unusual wear-resistance results in longer life, greater stamina and top dependability.

And Ampco Metal has other properties that pay off in severe service applications. It has high compressive strength — doesn't squash out. It resists abrasion, corrosion, cavitation-erosion. It gives you high impact and fatigue values and excellent bearing qualities. That's why Ampco Metal is ideally suited for the tough jobs — why it makes good where other metals fail.

Get Ampco Metal in almost any form you need — sand and centrifugal castings, bars, forgings, sheet, plate. You can also get tubes, extruded shapes, arc-welding electrodes, and welding wire.

Give both your product and production equipment longer life, extra stamina, greater freedom from trouble and breakdown by using Ampco Metal. Your nearest Ampco field engineer is glad to give you expert help on any problem. Call him or write us to find out where Ampco Metal can serve you best.

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FOR PLANNING AIDS P-K Engineering Data meets every need of designer, project, and methods engineers, gives anyone concerned with planning assemblies complete, clear, concise information. P-K Price Data speeds ordering routine, prevents errors. The P-K Socket Screw Dimension Finder shown in use is a pocket size plastic slide chart that gives all needed dimensions at a glance.

Look Beyond the Hex

The hex socket identifies all socket screws, but beyond the hex there's a big difference. If you have never tried P-K Socket Screws you are blocking your way to *proved* benefits other buyers are using to advantage.

Look *beyond* the hex. For example, until you see P-K product information, you'll have no idea how helpful it is . . . how much time it saves . . . how much easier it makes the job.

It pays to know the difference

Compare every detail of product and service. You'll find P-K Socket Screws take top rating by every test.

For cost-wise assembly, you need all these advantages. Why miss out on any of them? Try P-K Socket Screws. Get samples, information from your P-K Distributor or write: Parker-Kalon Division, General American Transportation Corporation, 200 Varick St., New York 14.

FOR ADVANCED DESIGN that speeds assemblies — makes them simpler, stronger — and saves errors.

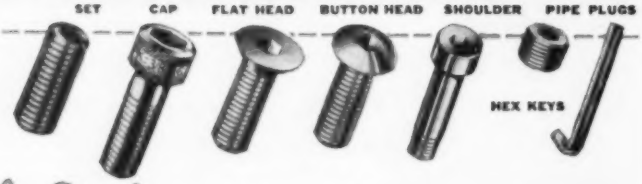
FOR ASSEMBLY STRENGTH okayed in a million punishing tests by thousands of satisfied users.

FOR PLANNING AIDS and buying data patterned to your special needs, plus advice on assembly.

FOR SUPPLY SERVICE set up for fast action and lower purchasing expense — by local Distributors.

FOR ANY STYLE OR SIZE You'll find any Socket Screw you need in P-K's complete line. Hex Keys in all sizes, and several handy sets.

PARKER-KALON SOCKET SCREWS



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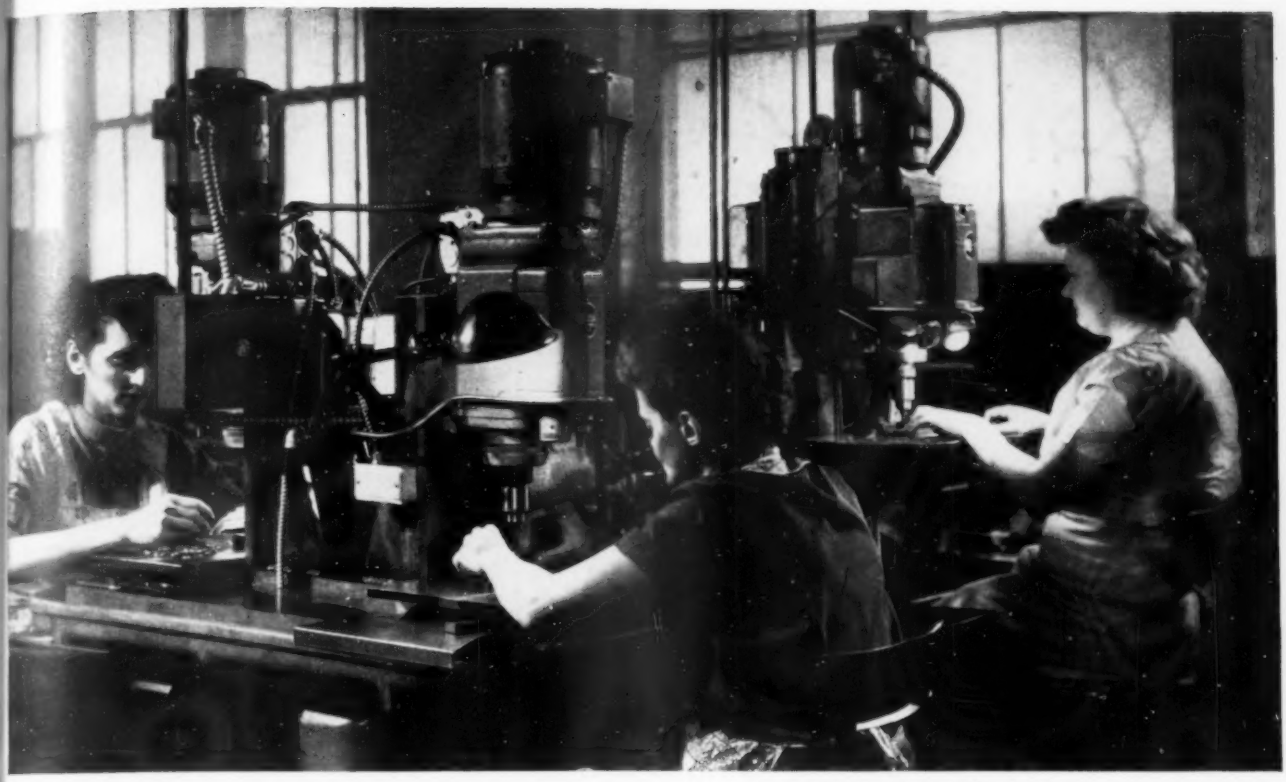


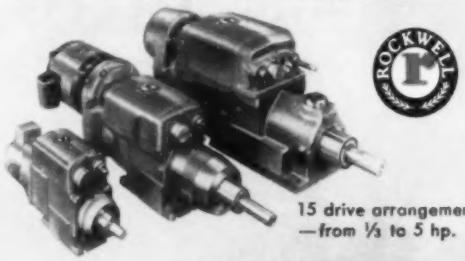
Three Rockwell Drill Units have cut costs of machining *Comptometer* parts no larger than 3/16" diameter at Felt and Tarrant Manufacturing Company.

Rockwell* Drill Units Cut Costs 11% *on Comptometer Parts Machining!*

Mr. John Schmidt, Chief Tool Engineer at Felt and Tarrant Manufacturing Company states:

- "Our three Rockwell Drill Units handle 15 different automatic operations."
- "The Rockwell Drill Units have not only cut production costs by 11%, but they give us consistent accuracy to tolerances within .0005". Being automatic,' there's no chance for operator error in close tolerance work."
- "We installed the Drill Units on low cost, shop-fabricated mountings and fixtures, one an old drill press column."

You can match—or exceed Felt and Tarrant's cost savings through better methods in your drilling, tapping, counterboring and kindred operations with Rockwell Air-Hydraulic Drill Units. Let your Authorized Sales Engineer discuss possibilities with you. He not only offers engineering counsel, but can also demonstrate right in your plant. Send the coupon today for his name.



15 drive arrangements —from ⅓ to 5 hp.

Air-Hydraulic **DRILL UNITS**

Another Product by **Rockwell**

*Originally produced by Rockwell under the trade name "Delta."

Drill Unit Division, Rockwell Manufacturing Company
306L North Lexington Avenue, Pittsburgh 8, Pa.

☐ Please send name of nearest Authorized Sales Engineer.
☐ Please send me latest Drill Unit Catalog.

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HELP YOU CUT PRODUCTION TIME . . .

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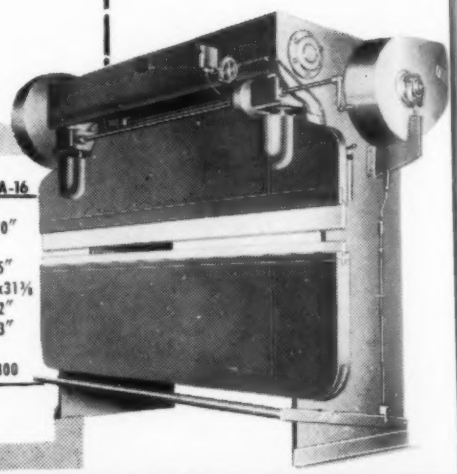
HAND OR MOTOR DRIVEN RAM ADJUSTMENT

ONE PIECE WELDED STEEL FRAME

CLEAR WORKING SPACE IN FRONT AND REAR

OVERSIZE LONG SLIDE SURFACES, CONNECTING RODS AND BEARINGS



Model	48-8	60-10	72-12	96-14	96A-14	120-16	120A-16
Length of Bed & Ram	50"	68 ½"	80 ½"	96"	96"	120"	120"
Distance Between Housings	39"	49"	61"	75"	61"	89"	75"
Floor Space	47½x31⅜"	57½x31⅜"	69½x31⅜"	83½x31⅜"	69½x31⅜"	108½x31⅜"	108½x31⅜
Stroke	2"	2"	2"	2"	2"	2"	2"
Adj. of Ram	3"	3"	3"	3"	3"	3"	3"
Motor HP and RPM	2-1800	2-1800	2-1800	3-1800	3-1800	3-1800	3-1800

STANDARD EQUIPMENT: A. C. 3 Phase, 60 Cycle, 220/440 Volt Motor, Overload Reversing Switch, Die Holder, Standard Back Gauge, Hand Ram Adjustment.

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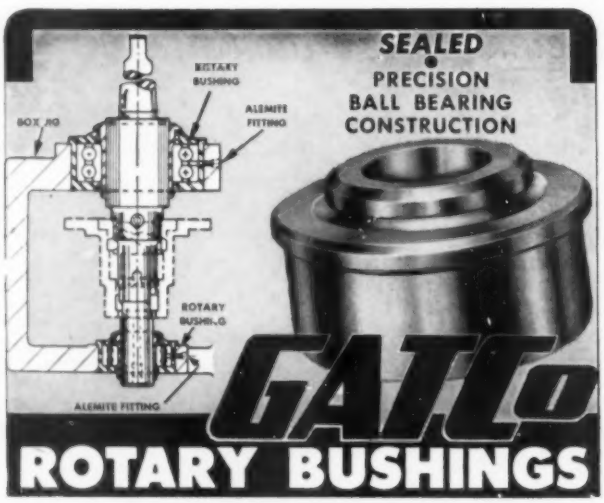

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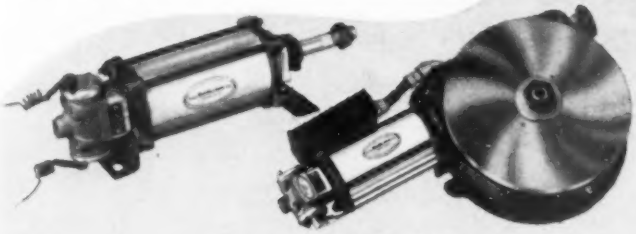
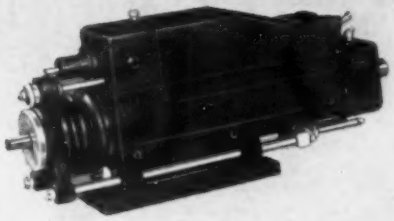
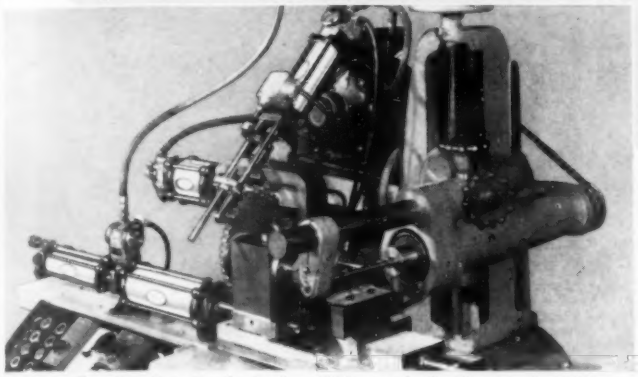




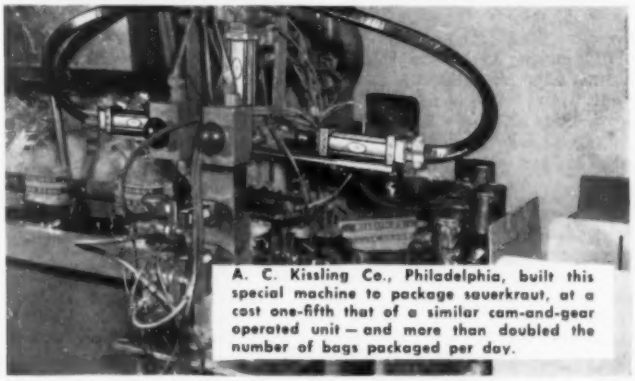
...you can build quickly in your own tool room special purpose, cost saving machines like these:



Acetogen Gas Co., Detroit, obtained a 600% production increase in milling splines for their gas cutting torch tips, with this special machine built around Bellows air equipment.

This special testing machine, built around Bellows "Controlled-Air-Power" Devices, increased production from 1,300 parts per day to 3,000 parts per day at the plant of Allis Seal Co., Chicago.

Radio Receptor Co., Inc., Brooklyn, N. Y., designed this tool-room-built cut-off and forming machine and jumped production over the old method by 350%.



A. C. Kissling Co., Philadelphia, built this special machine to package sauerkraut, at a cost one-fifth that of a similar cam-and-gear operated unit — and more than doubled the number of bags packaged per day.

1009A

The next time you get a chance, take a critical look at some of your routine operations — particularly those you've been handling the same way for the past four or five years. There are cost-savings there you shouldn't overlook.

The four illustrations on this page are typical of the ways that Bellows "Controlled-Air-Power" Devices and a little ingenuity can team up to accomplish big savings. It's worth checking into.

WRITE FOR THIS FREE 36 PAGE BOOKLET

Here in these quick-reading pages is the story of "Controlled-Air-Power" — what it is doing for others — what it can do for you. It's free on request. Dept. TE-1154, The Bellows Co., Bellows Bldg., Akron 9, Ohio. In Canada, write to: Bellows Pneumatic Devices of Canada, Ltd., Toronto

The Bellows Co.

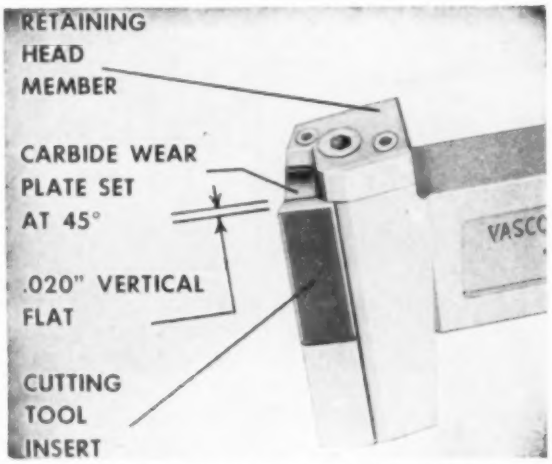
AKRON 9, OHIO

FIELD ENGINEER OFFICES IN ALL PRINCIPAL CITIES

CHIP CONTROL WITHOUT CHIPBREAKER GRINDING

Everyone is aware of the problems that are encountered in high speed machining with carbide tools which have no chipbreakers. Everyone is equally aware of the problems of development of the correct ground-in chipbreaker for different cutting speeds and depths of cut, factors which influence the ground-in chipbreaker.

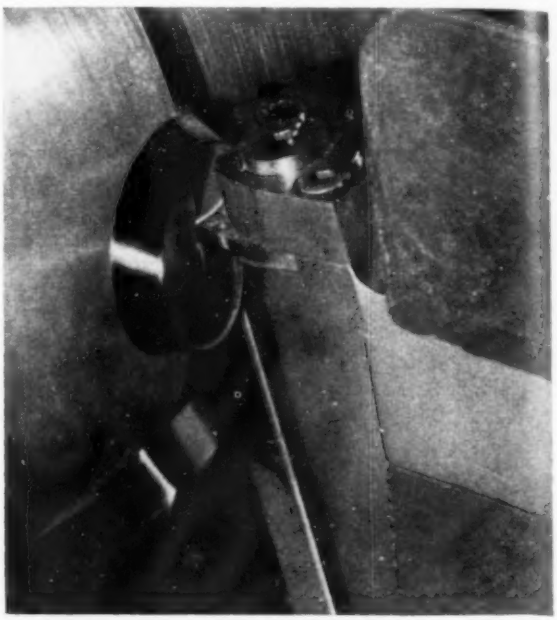
To eliminate the problems of grinding and other problems which occur when ground-in chipbreakers are used the Vascoloy-Ramet Corporation has designed a toolholder with a "Built-In" Chipbreaker Plate, as a part of the toolholder. This "Built-In" Chipbreaker Plate eliminates all chipbreaker grinding and is usable when cutting a wide variety of materials over a wide range of feeds and speeds. Because the Chipbreaker Plate is in intimate contact with the cutting tool insert, it removes some of the heat generated during the cut and thus prolongs cutting tool life, as well as eliminating chipbreaker grinding. The "Built-In" Chipbreaker Plate is an assembly of the retaining head member, made of steel, with a tungsten carbide wear plate to act as a chipbreaker. This carbide wear plate is set at 45° to the top surface of the cutting tool insert with a .020" vertical flat provided at the bottom edge for additional strength. No adjustment or re-grinding of the wear plate is necessary once the toolholder is properly in service. The life of the Chipbreaker Plate will, of course, depend on the severity of the cut but the replacement cost per cutting edge of insert is negligible.



The "Built-In" Chipbreaker in position on the head of the New Toolholder. All that is necessary to start production is to mount the toolholder.

The chip control width (distance from the cutting edge of the cutting tool insert to the .020" flat) of the Vascoloy-Ramet Toolholder is designed for chip segmentation in the direction of larger rather than smaller curl radii. This is important because the ideal condition occurs when chips are curled to the maximum radius at which they will still break since additional power is required to curl a small radius and additional wear results. The wider chip control width of these Toolholders also prevents "crowding" of the chip, and the chip pressure which results from tightly curled chips is reduced. All of the chipbreaker plates have been designed to operate most efficiently when there is a 1 to 9 ratio of feed rate to chip control width, however, the chipbreaker plate will maintain proper chip control over considerable variation of cutting depths and feeds, something not possible with the ground-in chipbreaker. When cutting most materials, segmented chips will be produced with the chipbreaker plate, if the ratio of feed to chip control width lies anywhere between 1 to 6 and 1 to 13. Below 1 to 5, there will be high pressure, excessive wear and danger of failure. Above 1 to 13, the chip may tend to curl or ball.

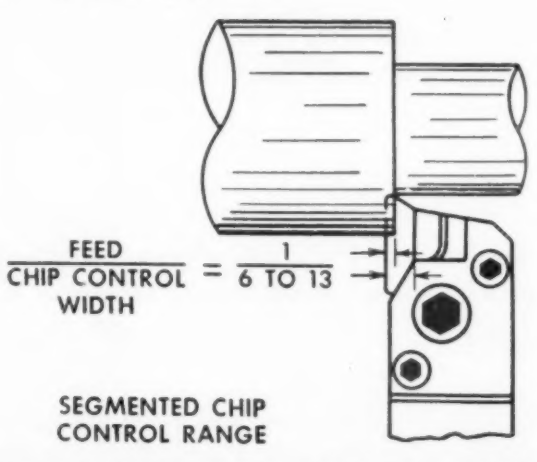
Segmented or broken chips produced over a wide range of feeds and depths of cut with a "Built-In" Chipbreaker Plate and a New Vascoloy-Ramet Toolholder.



Actual photograph of the "Built-In" Chipbreaker Plate on the New Vascoloy-Ramet Toolholder showing proper chip control by breaking the chip against a solid surface. Notice the large curl radius of the chip which is desirable because it requires less power to curl a chip with a large radius.

The Standard Chipbreaker Plate on the Vascoloy-Ramet Toolholder is of the parallel type, that is the .020" flat is parallel to the cutting edge of the insert. In some rare cases in order to obtain a broken chip an angular chipbreaker plate, with the .020" flat forming an angle with the cutting edge of the carbide insert, may be necessary. This type of chipbreaker plate is easily made by grinding a slight modification on a Blank Chipbreaker Plate. Blank Chipbreaker Plates are available as standards. This modification will then produce a secondary chip direction that will break the chip against a work shoulder or a solid surface.

Further information on the elimination of chipbreaker grinding and chip control with the "Built-In" Carbide Chipbreaker Plate may be obtained by writing the Vascoloy-Ramet Corporation, 856 Market Street, Waukegan, Illinois.



Segmented Chip Control Range of cutting depths and feeds for a "Built-In" Chipbreaker Plate and New Toolholder. A range not possible with a ground-in chipbreaker.

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Schrader Air Cylinders pack a power punch that can't be beat. Ideally suited to pushing . . . pulling . . . lifting . . . lowering — wherever straight-line repetitive operations are required — Schrader Cylinders are used in innumerable applications in industries of all types.

Schrader has a *complete line* of cylinders that will meet any requirement. They are available in single or double acting in any type of mounting and in any stroke.

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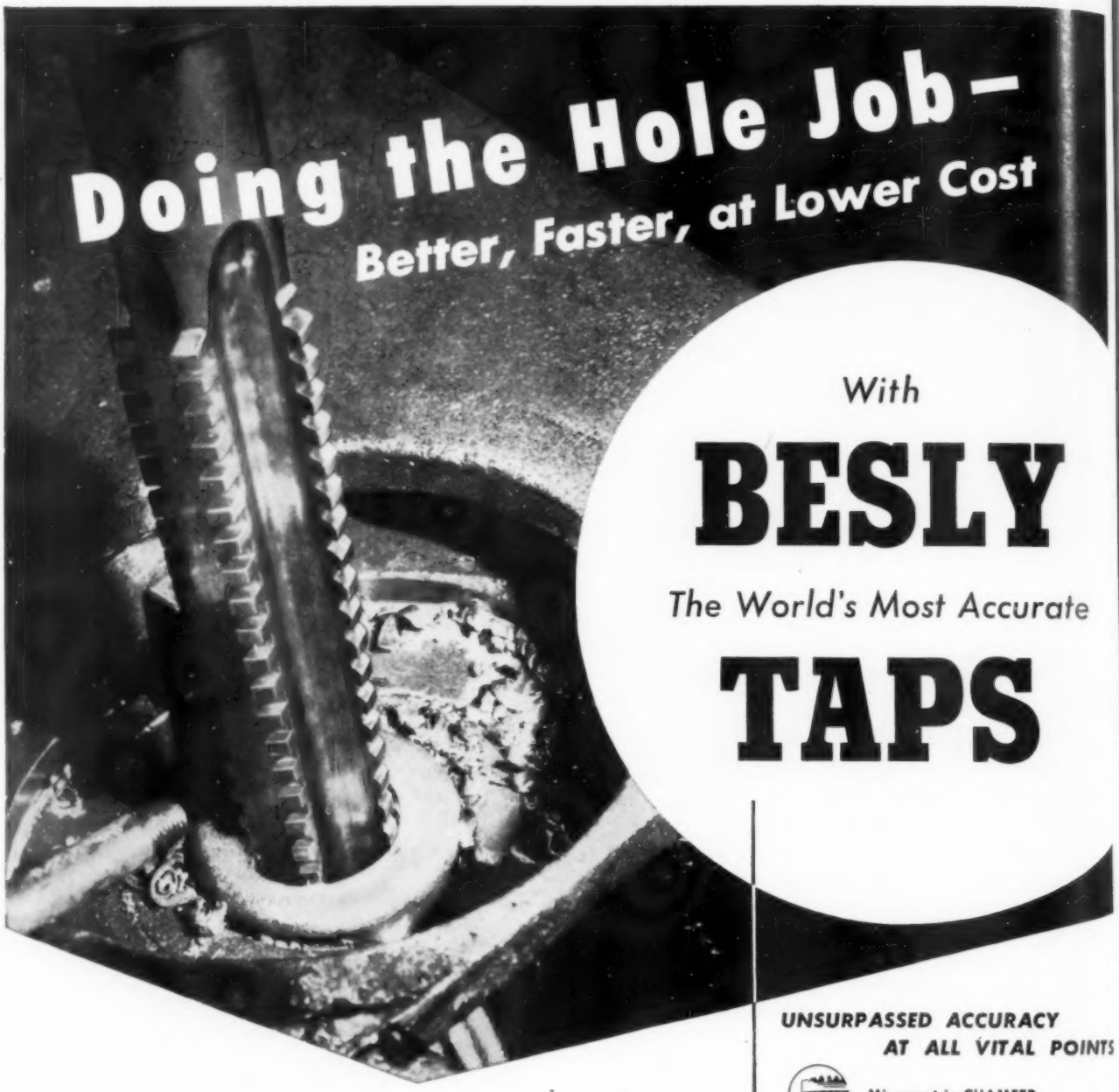

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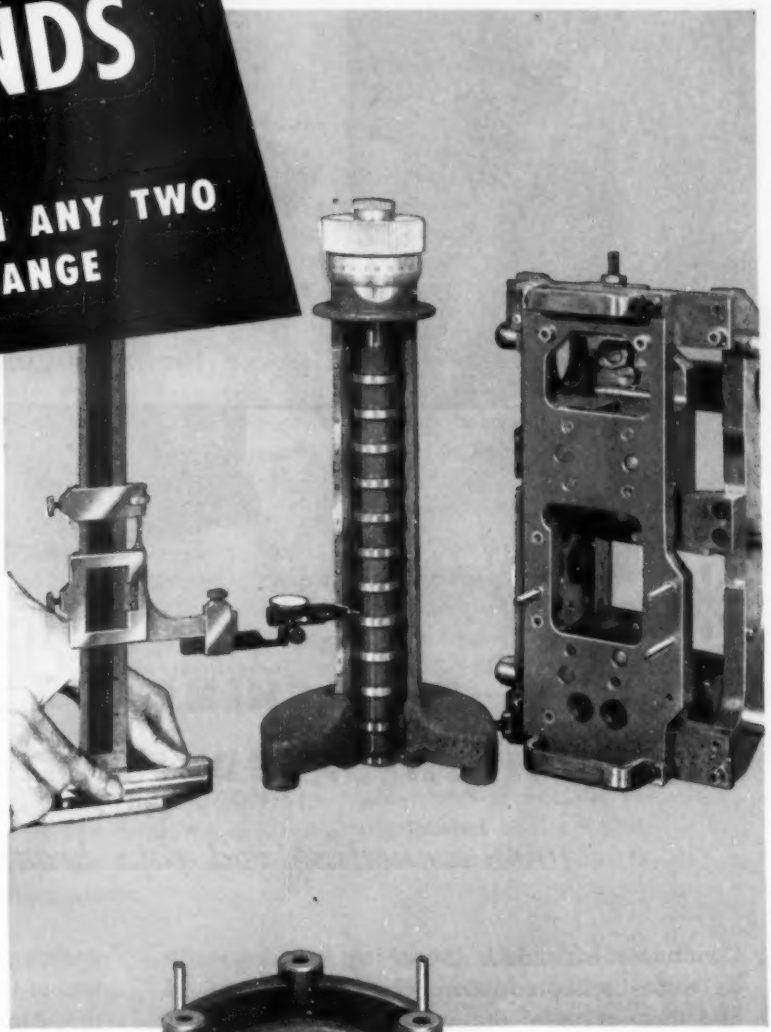

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And, accuracy is assured! Between any 2 points in the 12" range accuracy is guaranteed within .00005".

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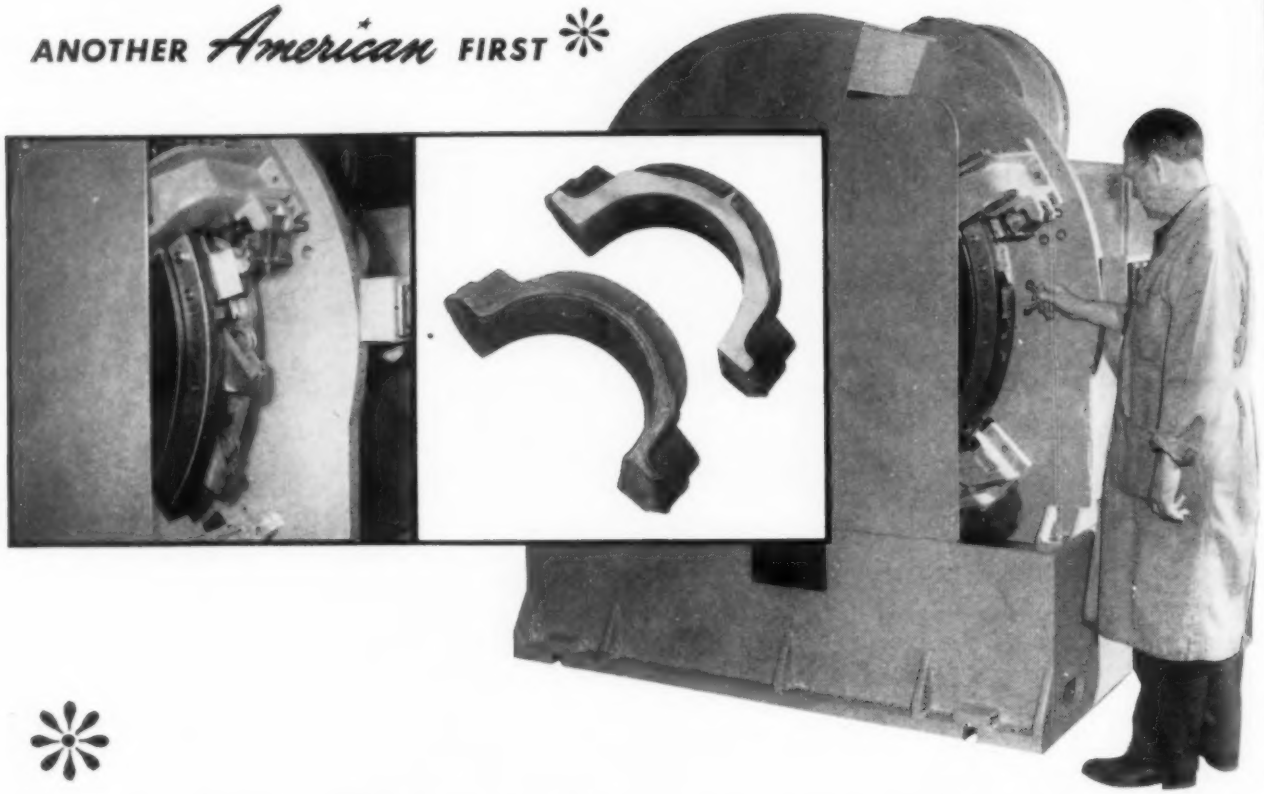

STRADDLE BROACHING ON ROTARY MACHINE MEETS HIGH-SPEED PRODUCTION DEMANDS

1000 connecting rod caps broached per hour —

Continuous, automatic broaching is a necessity on some high production jobs. When required and the nature of the work permits, American engineers develop special, revolutionary machines to solve bottlenecks and reduce metal removal costs to the lowest possible point.

A typical example is this special 36" Rotary Continuous Surface Broaching Machine. It is designed to straddle broach two sides of a connecting rod cap. The production cycle is continuous. The operator manually loads parts into the holding fixture. As the part moves into broaching position it is automatically clamped, broached, unclamped, and ejected into the chute at the bottom of the machine. Operating at 75% efficiency, this American machine is capable of producing 1000 parts per hour. The connecting rod cap is a steel forging.

For practical, high production, low cost solutions to your metal cutting problems see American first. A sample part or detail drawing and mention of your production requirements will receive prompt attention from American.

Write today for American Circular 300 which gives you data on standard American Vertical Hydraulic Surface Broaching Machines.

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Only Firth Sterling can serve you so completely in solving the tooling problems that enable you to make production profits . . . for these six convincing reasons:

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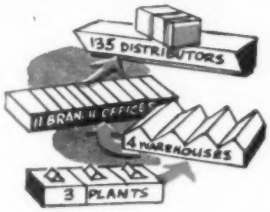

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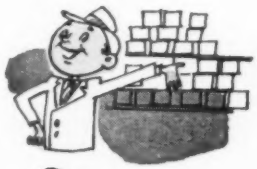
CONSTANT RESEARCH Continuing full-scale research with emphasis on product improvement, specialty steels, carbides, new metals and new methods assures you years-ahead tooling procedures when you make Firth Sterling your one-stop source of supply.



PACKAGED TOOL LINE The most complete line of packaged tools available comes in standard quantities, easy to handle, stock, identify and inventory . . . in both steel and carbide.

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Has interchangeable male, female and pipe points for all centered and uncentered work. Morse tapers 1 to 5, also straight.

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DIE LIFE MORE THAN DOUBLED AT

● UNIVERSAL OIL SEAL CO.
Pontiac, Michigan

krome-king

PRECISION HARD CHROME PLATING UNIT
Does the Job ECONOMICALLY

Universal Oil Seal Company, Pontiac, Michigan protects the wearing surface of their metal forming dies used in stamping the shells for oil seals. The use of a Krome-King plating unit has more than doubled die life, scoring of finished metal is practically eliminated and tolerances of completed parts are held more uniform. The simplicity of the plating operations is one of the outstanding features of Krome-King. Universal Oil Seal has been able to repair a worn die without disturbing their production schedule on many occasions. This of course shortens down time on machines and boosts production.

WRITE TODAY FOR COMPLETE DETAILS

krome-king
NATIONAL FILE COMPANY
North Cedar, Lansing, Michigan

WRITE TODAY DEPT. P

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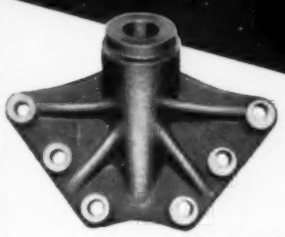
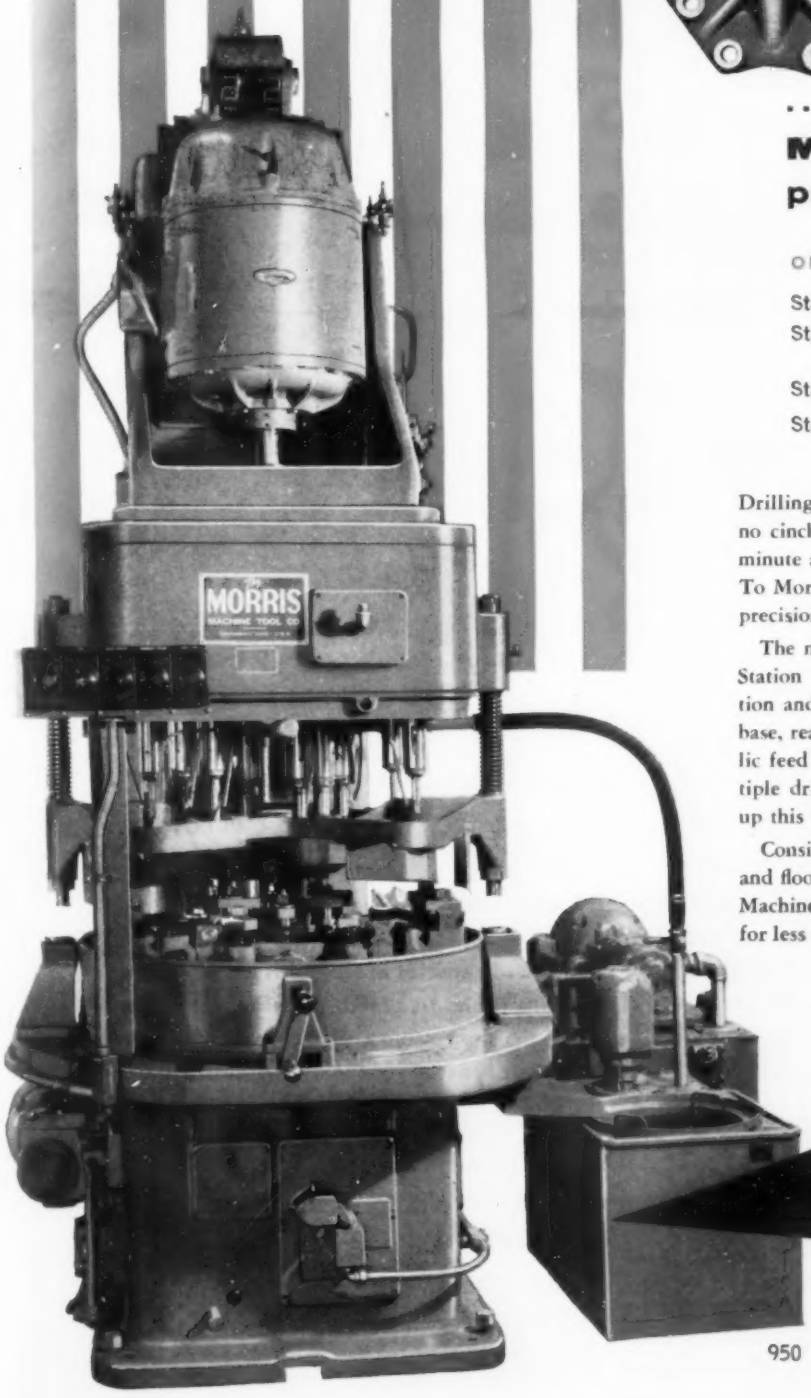
TO OBTAIN FURTHER INFORMATION ABOUT ADVERTISERS, TRADE LITERATURE OR TOOLS OF TODAY APPEARING IN THIS ISSUE OF THE TOOL ENGINEER, USE THE HANDY READERS SERVICE CARD ON PAGE 167.

a tough job... an easy solution



...another MORRIS MOR-SPEED production machine



OPERATIONAL CYCLE:

Station	1	Load and Unload
Station	2	Drill two 57/64″ holes Drill four 29/32″ holes
Station	3	Spot face six holes
Station	4	Ream (.9062″) two holes

Drilling six large holes in armor plate forgings is no cinch, but when you want a finished part every minute and twenty seconds, that's a tough problem. To Morris Engineers, it was a familiar problem... precision drilling on a mass production basis!

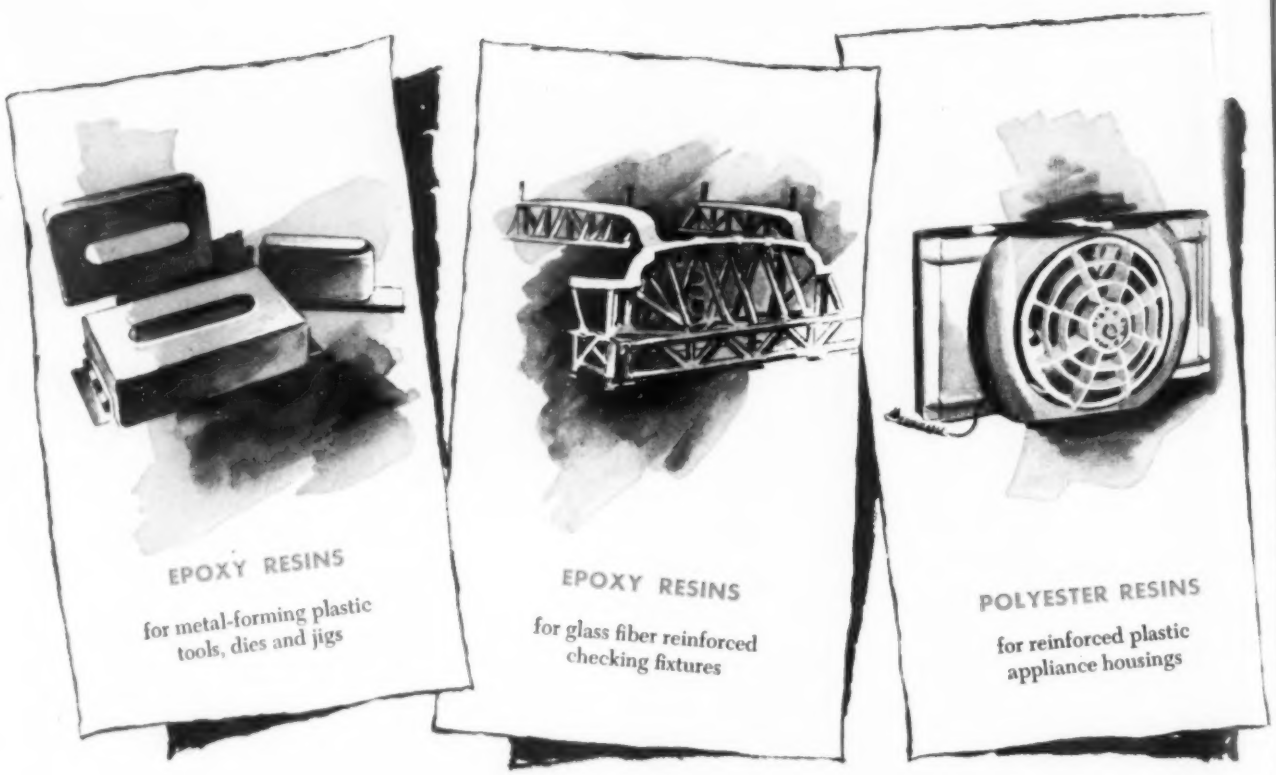
The machine furnished was a MOR-SPEED Four Station Vertical, giving "special machine" production and precision at remarkably low cost. Standard base, rear column, indexing table, slide and hydraulic feed mechanism are combined with special multiple drilling head and work fixtures . . . to make up this high production machine.

Consider the savings . . . investment, labor, time and floor space . . . offered by Morris MOR-SPEED Machines. Precision high production can be yours for less than you might imagine!

Ask your Morris representative for details on our deferred payment plan.

Morris

950 HARRIET STREET CINCINNATI 3, OHIO


EPOXY RESINS
for metal-forming plastic tools, dies and jigs
EPOXY RESINS
for glass fiber reinforced checking fixtures
POLYESTER RESINS
for reinforced plastic appliance housings

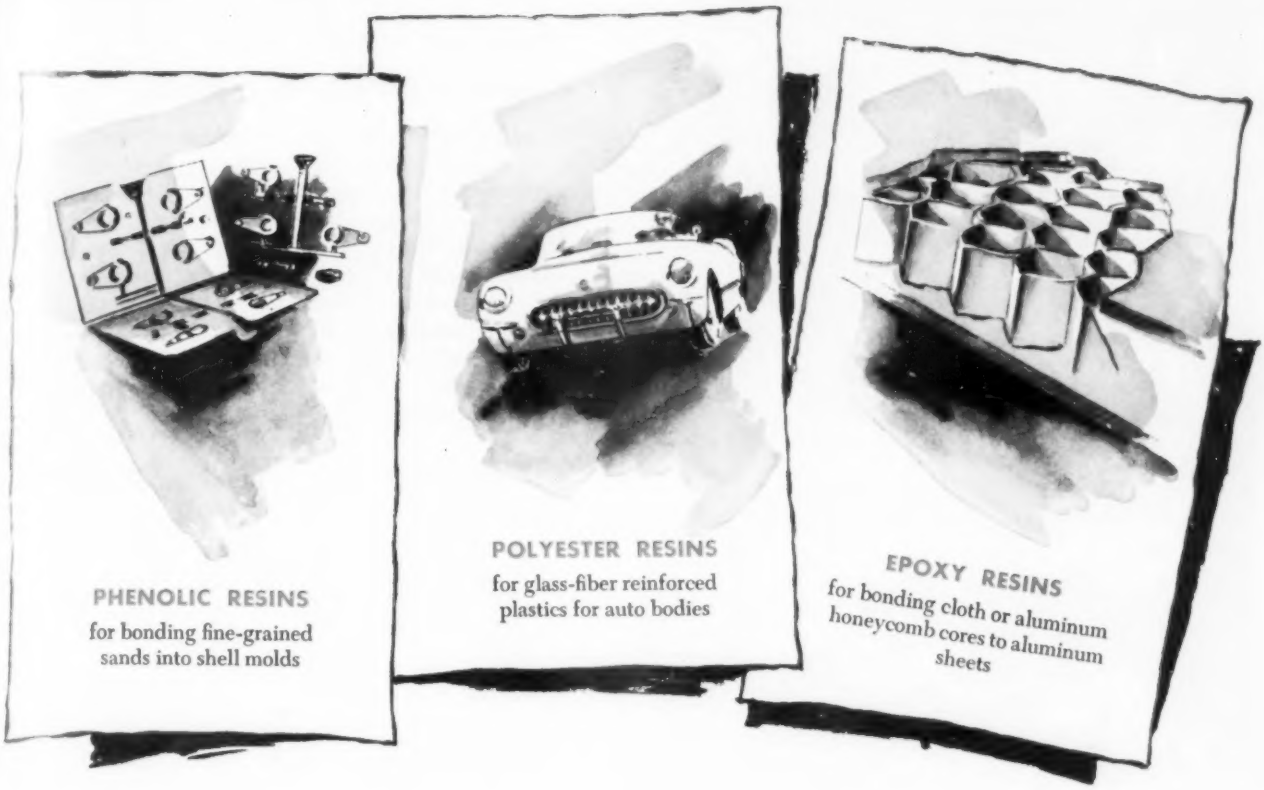
PLASTICS AT THE

Visitors to BAKELITE's Exhibit at the recent Metals Show were able to learn of the latest developments in plastics firsthand. Here are a few of the important advances which attracted greatest attention:

. . . metal parts produced with epoxy resin tools and dies
. . . foundry castings produced from shell molds bonded with phenolic resins
. . . checking fixture of glass fiber reinforced plastics made with epoxy resins
. . . automobile body sections made from glass fibers and polyester resins
. . . honeycomb cores bonded to aluminum sheets with epoxy resins
. . . fans and other appliance housings of polyester reinforced plastics

These developments are not experimental ideas . . . they are in actual use right now, as a result of the unique properties of BAKELITE Plastics.

Bakelite Company offers the largest variety of plastics and the greatest resources for developing their use to your benefit. It will pay you to consult with BAKELITE technical representatives to see how plastics can tie in with your new product ideas . . . for new advantages in production and performance. As a start, write Dept. ZX-75.



PHENOLIC RESINS
for bonding fine-grained sands into shell molds

POLYESTER RESINS
for glass-fiber reinforced plastics for auto bodies

EPOXY RESINS
for bonding cloth or aluminum honeycomb cores to aluminum sheets

METALS SHOW

BAKELITE
TRADE-MARK

PLASTICS

TRADE MARK

BAKELITE COMPANY

A Division of Union Carbide and Carbon Corporation

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Lapping For Precision Flatness and Parallelity in Production Quantities

...with a LAPMASTER

This is the machine for you if you want precision flatness in production quantities at low cost. Lapmasters readily lap to the extreme close tolerance of one light band (.0000116") or less. In addition they produce an extremely fine finish to as low as 1 RMS. They are available with 12", 24", 48", 72" or 84" lapping plates.

THIS IS HOW THE LAPMASTER WORKS

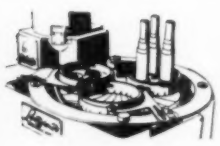
I, a heavy cast iron lap plate revolved slowly under power. **II,** large cast iron conditioning rings are held in position and rotate freely on the lap. **III,** work pieces are placed inside the conditioning ring where they also rotate on the lap. **IV,** a liquid vehicle containing fine loose abrasive flows on the lap plate and is uniformly distributed under the work pieces. At the same time the rotating conditioning rings preserve the flatness of the lap plate. These three essential features, combined with the rapid cutting action of loose abrasive produces a flatness which meets every production requirement.

1 Operator requires no previous lapping experience.

2 Lapping with loose abrasive and without excessive pressure eliminates heat and subsequent distortion.

3 Simplicity of design provides accessibility and allows ease of loading and unloading.

4 Loose abrasive distributed evenly over lapping area insured uniform results.



5 Precision laps identical parts in one cycle or parts of various shapes, heights and materials in one cycle.

6 Lap plate always kept in condition while in operation. No down time required for truing or reconditioning.

Learn more about the possibilities of production lapping and the interesting subject of measuring flatness. The illustrated fact-filled booklets are yours for the asking. Write today.

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CRANE PACKING COMPANY

38 YEARS INDUSTRIAL PROGRESS

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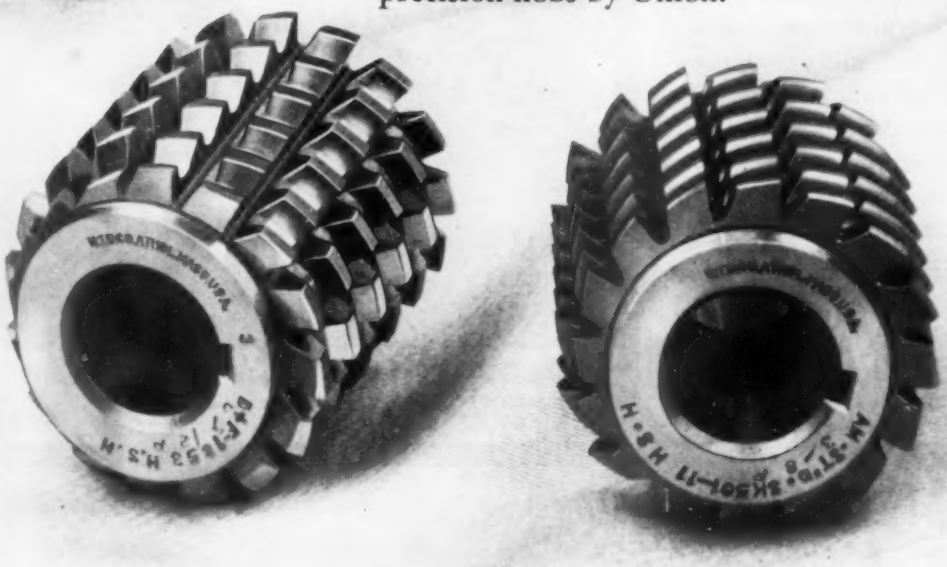
Precision was built into every detail of this Nineteenth Century clock.

Today, the finest gears are mechanically reproduced by means of precision-built hobs. For the best in hobs — demand precision hobs by Union.



Renaissance 19th Century French Clock, made in Paris by RAINGO, *Circa* 1840

HOBS

Involute Spline
Parallel Spline
Worm Gear
Tangential
Spur Gear
Helical Gear
Ground
Unground
Accurate Unground
Finishing
Roughing
Preshave
Protuberance
Stub-Tooth
Standard Gear
Composite Form
Combination Pitch
Topping
Semi-Topping
Non-Topping
Herringbone Gear
Shank Type
Shell Type
Serration
Square Shaft
Tapered Hole
Multiple Thread
Special Shape

SPROCKET

Silent Chain
Roller Chain
Special

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Milling Cutters Gear Cutters Twist Drills Hobs Reamers Carbide Tools

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Congratulations to Caterpillar Tractor Co. on their "50 Years on Tracks" Commemoration. We are proud to serve them.

ERICKSON MANDRELS

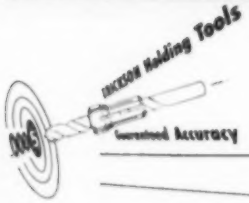
help improve CATERPILLAR® track roller bushing quality . . . and speed production!

When Caterpillar Tractor Co. completely revised their method of machining Track Roller Bushings, Erickson mandrels were selected to hold the bushings during rough and finish turn, face and form operations.

Erickson mandrels used in some present bushing machining methods at Caterpillar are accurate, quick acting and dependable. Bushing production has been increased and quality improved. Erickson mandrels have contributed to these improvements.

Because of their quick action, automatic release, positive alignment and guaranteed accuracy within .0005" T.I.R., both Erickson mandrels and collet chucks have helped to speed production and improve quality in every installation. Why not let an Erickson sales engineer give you a free demonstration. Write or call today! AA-356

Multiple spindle lathes equipped with Erickson mandrels machine track bushings at Caterpillar Tractor Co.



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2303-N Hamilton Avenue • Cleveland 14, Ohio

COLLET CHUCKS • FLOATING HOLDERS • TAP CHUCKS • TAP HOLDERS • AIR-OPERATED CHUCKS
EXPANDING MANDRELS • SPECIAL HOLDING FIXTURES

BIG PARTS—Sterling Engine Company checks surface finish on crankshafts, camshafts, milled surfaces, gear teeth, and other work with the SURFINDICATOR. It's portable and can be used right on the job!

"SURFINDICATOR—*Eliminates arguments on surface finish!*"

"ALTHOUGH IT IS DIFFICULT to estimate the savings made possible with gaging equipment," states Sterling Engine Company, "we have realized definite dollar savings with the Brush SURFINDICATOR* just through the elimination of arguments." Sterling uses the SURFINDICATOR to check finish on many precision parts where a microinch finish is specified.

The SURFINDICATOR speeds inspection, saves time, and can help *you* eliminate costly overfinishing. It can be set up easily for operation by shop personnel. Write for booklet—or ask for a demonstration of the SURFINDICATOR in your plant. Brush representatives are located throughout the United States. In Canada: A. C. Wickman, Ltd., Toronto.

*Trade-Mark

SMALL PARTS—Chance Vought Aircraft, Inc. checks interior smoothness of fuel valve poppets used in the Cutlass jet fighter with the Brush SURFINDICATOR. Interior surfaces are measured with aid of small-bore pickup.

BRUSH ELECTRONICS COMPANY
INDUSTRIAL AND RESEARCH INSTRUMENTS
PIEZO-ELECTRIC MATERIALS • ACOUSTIC DEVICES
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☐ Please send free copy of "Surface Finish Control."
☐ Have your nearest representative demonstrate the SURFINDICATOR to me.

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Company _____
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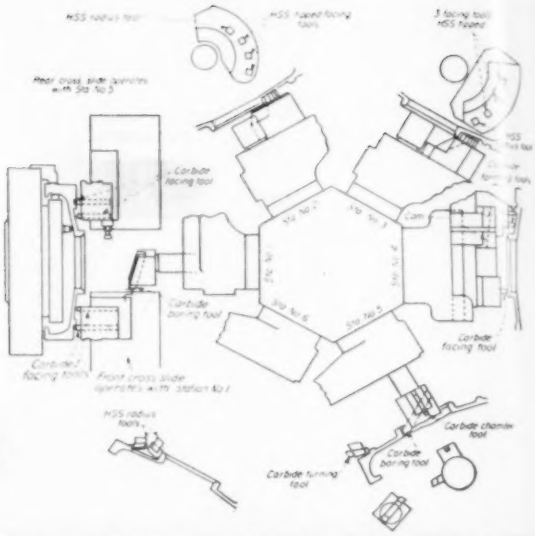
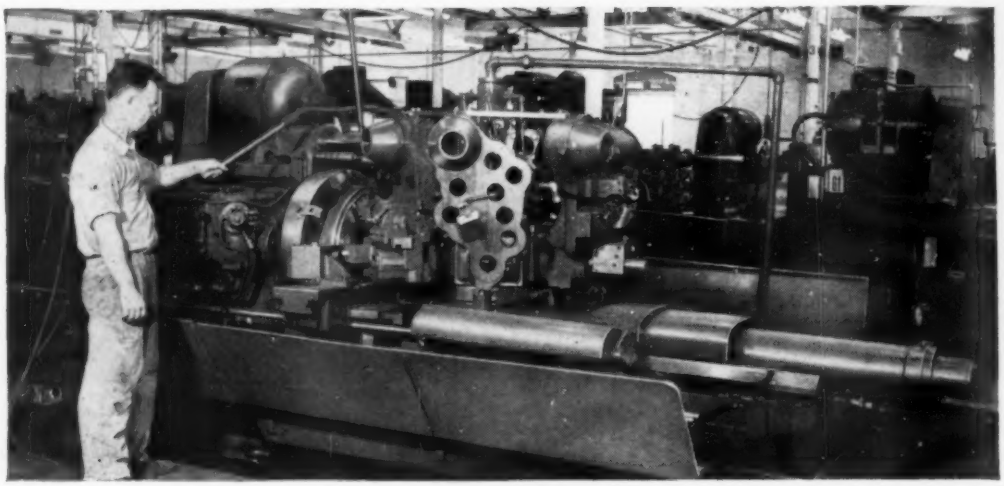
how *Curtiss Wright* increases production





Note setup using both HSS and carbide tools to handle rough and finish cuts including 2 stations which sweep a circular swath about 2" wide.

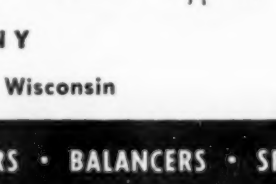
with the

FASTERMATIC

automatic turret lathe

It's a complex machining job, this front end section for an aircraft engine. But the Fastermatic does it at a fast rate, handling 20 cuts in 37 minutes. That's because the Fastermatic has the rigidity to take multiple cuts at high speeds with carbide tools. What's more, it's all automatic operation.

Once the job is set, the machine does all the work—efficiently, and with repeat accuracy, piece after piece. Why not find out what it can do to increase your production and cut your costs?



THE GISHOLT ROUND TABLE *represents the collective experience of specialists in machining, surface-finishing and balancing of round and partly round parts. Your problems are welcomed here.*

GISHOLT MACHINE COMPANY

Madison 10, Wisconsin

TURRET LATHES · AUTOMATIC LATHES · SUPERFINISHERS · BALANCERS · SPECIAL MACHINES

Only SUPERIOR

PRECISION—ALL STEEL

DIE SETS

Give You These

3 Features

For Safer Faster Handling

1 SAFETY FLANGE

protects fingers by providing roomy gripping space on either side of the die shoe. This flange may be mounted flush or on the edge of the die set and is welded in place. *There is no extra charge for this valuable safety feature.*

2 LOCK JAW LIFTING DEVICE

removes the danger of handling large die sets. Heavy steel components of this device are welded in place forming an integral part of the die set. They are positioned to insure proper balance when the set is lifted by either chain fall or crane.

3 E-Z LIFT SLING CHAIN

is especially designed to fit the safety flanges of the die sets. Male jaws attached to the sling fit quickly into place for immediate lifting. There is no need for screw clamps, eye bolts, or lifting lugs. Nor is there danger of distorting stresses being set up in the die or set because of improper lifting.

It's no longer necessary to take needless risks in handling die sets. Risks that might easily injure the hands of skilled die makers, ruin costly dies in process or completed, or even damage press equipment. Safety features of Superior die sets have eliminated all of these dangers and have speeded up the overall handling of sets from the bench to the press. Prove to yourself the merits of these safety features in both small and large die sets.

FREE CATALOG—*Write today for this helpful data on Superior die sets and die makers' supplies.*

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Why build a special machine for drilling radial holes when a standard machine equipped with Govro-Nelson Automatic Drilling Units will, in many cases, perform the work of a special machine that would cost considerably more!
Any number of drilling units up to eight may be employed. the units being movable not only through 360 degrees on the circular table but also movable endwise on riser plates to meet the requirements of the part being drilled.

The machine may also be used for tapping operations with Govro-Nelson Tapping Units. It has a range of 1/32″ to 3/8″ on drilling operations and 0-80 to 3/8-16 on tapping operations, depending on material and spindle speeds. A single, momentary contact start-button causes all units to operate simultaneously.

If you are interested in reducing the cost of your radial drilling and tapping operations, write for price and dimensional data.

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GOVRO-NELSON CO.
Machinists of Precision Parts for 31 Years
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High speed drills for small holes. Sizes from .08 mm (.003″) to 1.0 mm (.040″) carried in stock, in increments of .01 mm (.0004″).

Sphinx brand micro-drills used throughout the world for many years for all fine watch and instrument work.

Send for Bulletin N listing sizes and prices of stock drill sizes and micro-drilling equipment.

These precision drills are available in two styles, flat pivot drills or spiral fluted drills. They are made with concentric oversize shanks. Because of their rigidity they are especially useful in all types of drilling equipment.

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• *INCREASE PRODUCTION!*

Reduce scrap. Improve quality on your cylindrical grinding operations.

The Model 229-ABD Foster "ELECTROSIZER" Gage illustrated, sizes the work during the actual grinding operation.

It features: Automatic dwell control ahead of finished size. Automatic retraction of wheelslide at finished size.

For the first time an automatic gage which can be used to accurately grind splines or interrupted surfaces.

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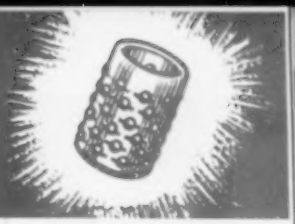

2 POST *BALL BEARING* DIE SETS

ARE PRICED DOLLAR-FOR-DOLLAR WITH

COMMERCIAL PLAIN BUSHING DIE SETS!

IMMEDIATE DELIVERY FROM STOCK.

LARGE & SPECIAL LEMPCO BALL

BEARING DIE SETS *NOW* QUOTED AT

DRASTICALLY ***REDUCED PRICES!***

DELIVERY: Within 5 DAYS···SPECIALS, 10 DAYS.

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Lempco's rapidly growing die set VOLUME makes this price reduction possible.

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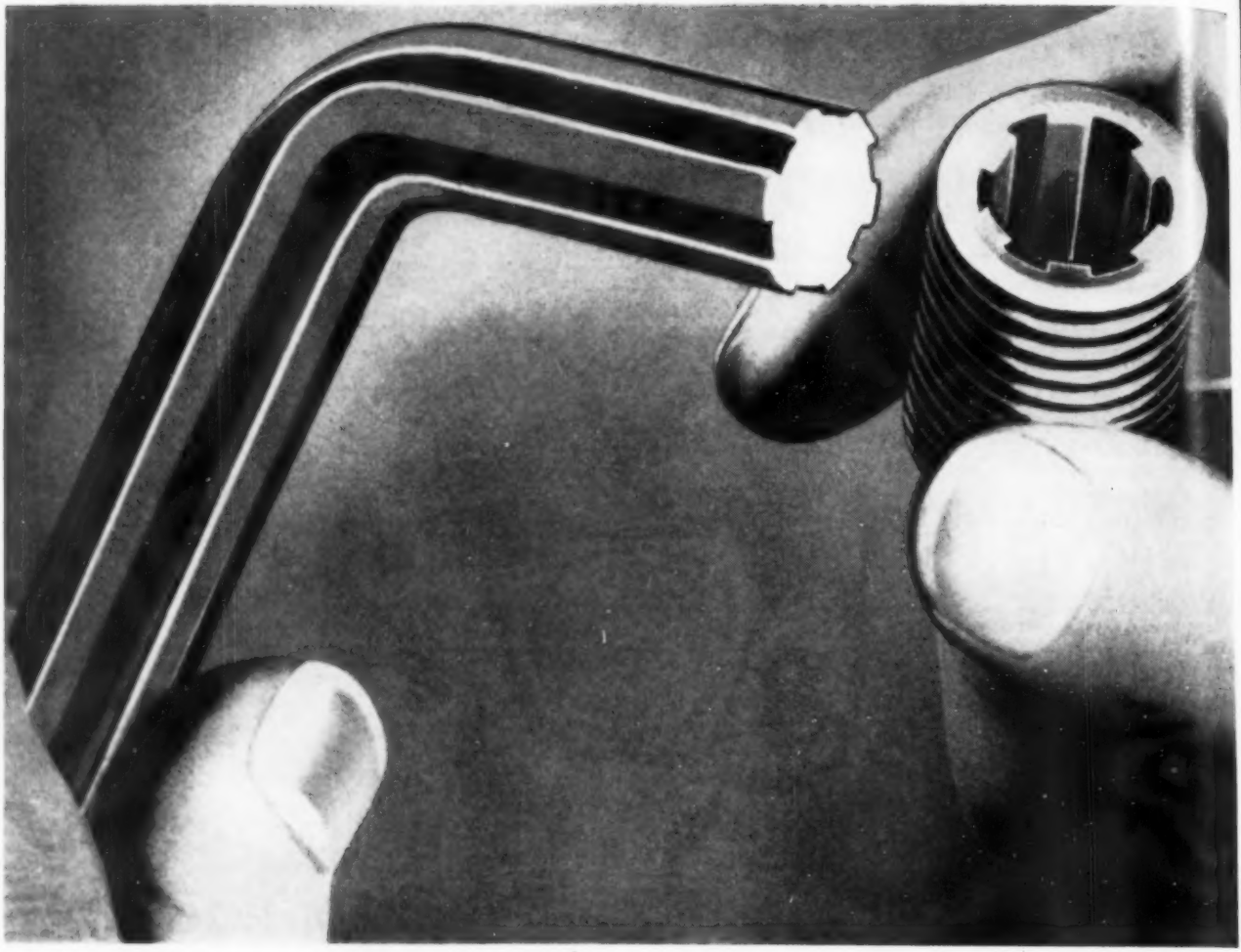

Multiple-Spline Set Screws hold tighter– because you can wrench them tighter!

The extra holding power of Bristol's exclusive multiple-spline set screws enables these flush-fitting fasteners to be used in the newest, most compact design applications.

They withstand severe shock and vibration, permitting fewer and smaller screws to be used without sacrificing strength.

While the splining principle has long been recognized as the best means of transmitting rotary power, the materials of which they are made also contribute to the tremendous holding strength of these Bristol set screws. Standard screws are made of heat-treated alloy steel; bronze, brass, monel or other metals are available on special order.

Bristol multiple-spline set or cap screws are carefully designed to close tolerance (ASA approved) in sizes from 0 wire to ½" in diameter. Get them through your regular industrial distributor.

BRISTOL'S SOCKET SCREWS

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IN ACTION

1,800 PERFECT HOLES WITH AN ATRAX CARBIDE TYPE REAMER

A CASE HISTORY: One of our Mid-Western customers has reported a comparison performance of a Solid Carbide Reamer versus a Tipped Type Reamer in Stainless Steel. The Tipped Type Reamer produced egg-shaped holes with poor finish which did not pass inspection, and production obtained was very low. When ATRAX Solid Carbide Reamers were put into use, the first reamer used produced 1,800 holes. *Each hole was absolutely round and the finish obtained was exceptional!* Although the cost of the Solid Carbide Reamer was approximately twice that of the tipped reamer, the end results obtained were not comparable since the tipped reamer could not produce satisfactory holes on a production basis.

This is one of a series of factual cases. Possibly our engineers or sales representatives can help YOU achieve similar savings. You'll find them in all principal cities, ready to consult without any obligation.

NEW! Complete 88-page Manual and Catalog of Carbide Tools. Write for your free copy.

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- Single or Multiple Head Operation
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- Fast, Accurate Rugged Index
- Other Head Units Available
- And Many Other, Worthwhile Features

Send prints and sample of your work for further information and recommendations on how Kaufman Tapping Machines can reduce your production costs.

THE MODEL 75-24 KAUFMAN TAPPER

Catalogs Number 754 and 1153 Mailed on request

KAUFMAN

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New LASSY Work Holder
is a low cost production tool having interchangeable jaws and clamps that hold single or multiple pieces. Ideal for scores of holding applications, eliminating many costly special fixtures.

Work stops, interchangeable jaws and clamps, riser blocks and drill bushing plate are standard accessories.

Semi steel casting, normalized and precisely machined, maintains accuracy of five ten thousandths in 3 inches. All parts subject to wear are hardened.

Special designs to meet your requirements.

Write for illustrated form WH 654 for complete information.

LASSY TOOL CO.
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MAGNI-FOCUSER
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SIZES: 20" focal lgth. 1½ power — 14" focal lgth., 1¾ power, 10" focal lgth., 2½ power; 8" focal lgth., 2¾ power . . . . . price each ONLY 10.50

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SIZE: 60" high, 27" wide, 29" base
Use this Press in the Shop or take it with you on the job. Frame is 4" welded channel iron. Has 48" stroke, 2½" diam. ram. Valve operates piston in both directions. Adjustable platform. Positive power Hand Pump with handle. 2000 PSI pressure gauge. 129.00

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We stock over 100,000 Hydraulic Cylinders in 106 different types and sizes. These can be adapted wherever tremendous power is needed to push, pull, hoist, mould or drive, etc.

SPECIAL
Gives 29,000 lb. thrust using 1500 PSI line-pressure as obtained from our hydraulic pumps. Will produce up to 40,000 lb. thrust with 3000 PSI. Can also be used on a low pressure air system. Has 4" bore; 18" stroke; 30⅝" lng. Ideal for shop. Part No. 29 USED 29.95 NEW 43.95

HYDRAULIC HAND PUMP
Operating pressure 1500 PSI. Cap., 1.5 cu. in per complete cycle . . . 12.75

HYDRAULIC ACCUMULATORS
A-2B FLOATING PISTON TYPE — 4"x 18" Built to stand 2,000 PSI 12.75
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SLIP-PROOF

STRONGEST CHUCK MADE

TRY ONE

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41 to 60
and
No. 61 to 80
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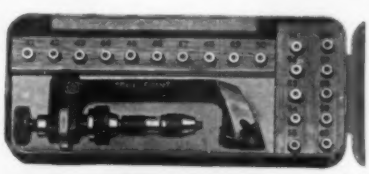

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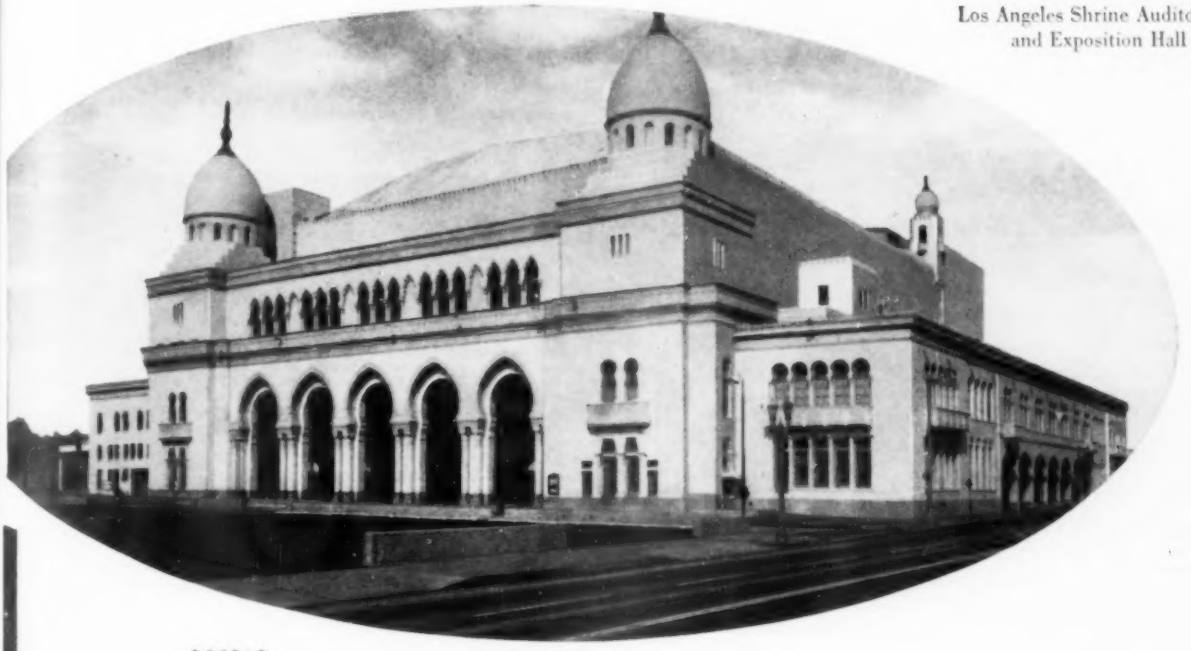

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November 1954 Issue

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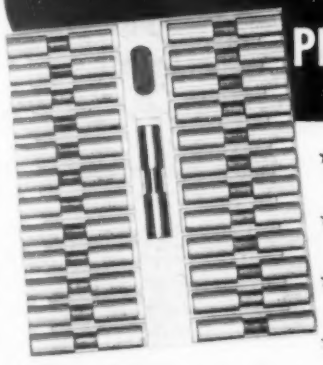

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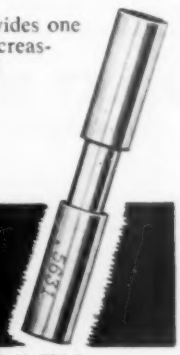

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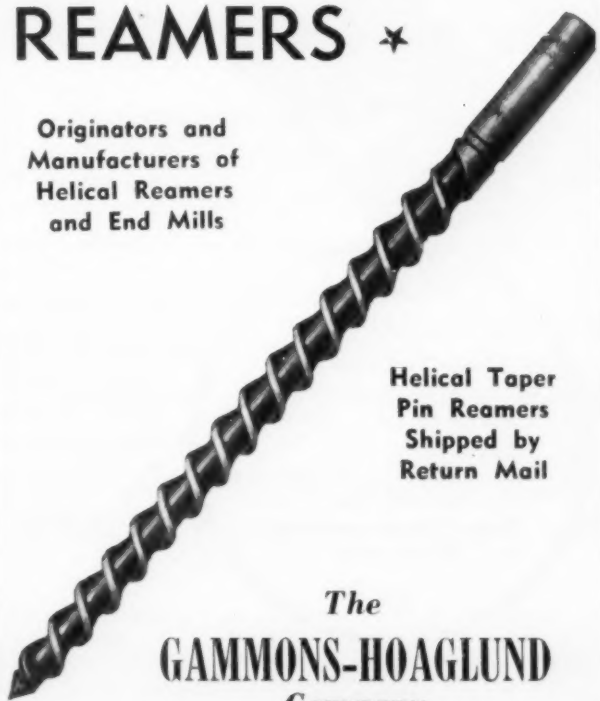

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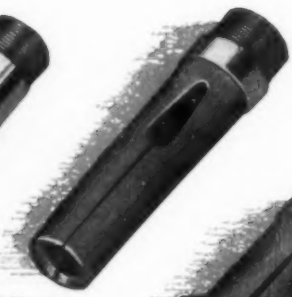

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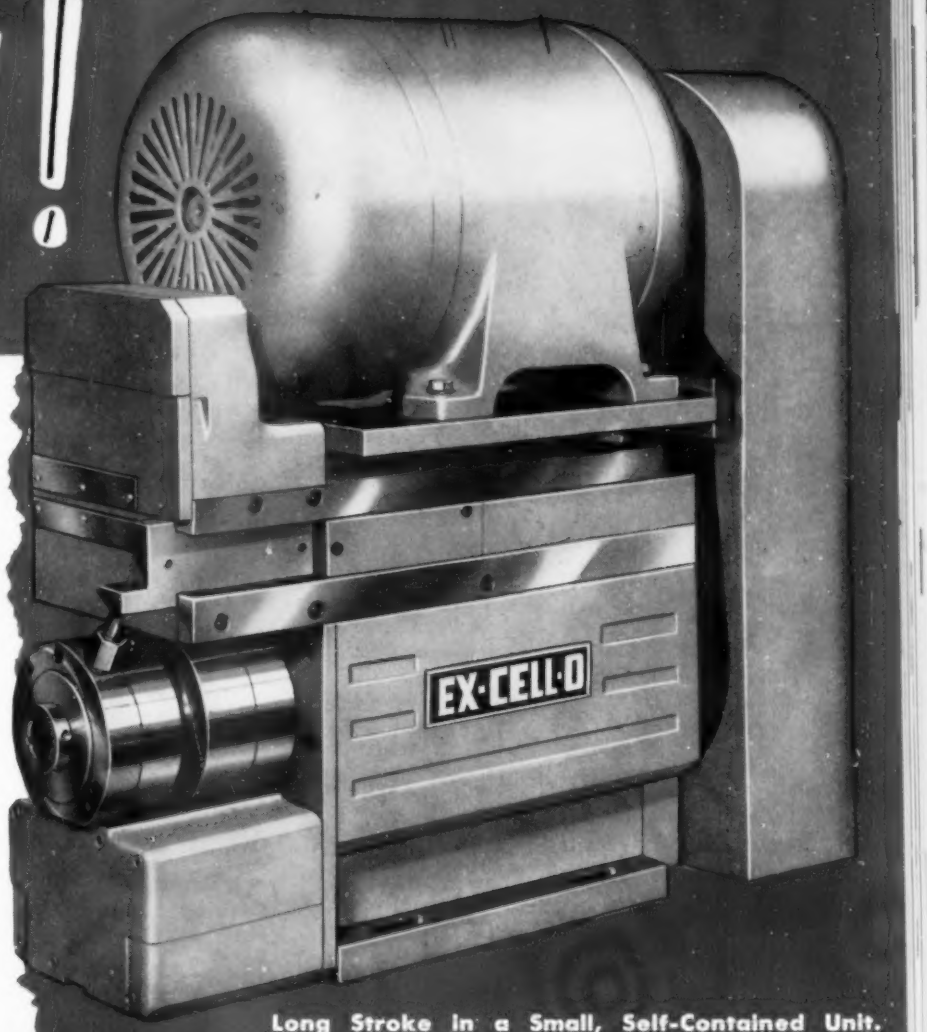

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